USER MANUAL
Xsite EASY System

Please completely read this document and the contained safety instructions and note all given information before usage.

Keep available for further consideration!!

ENGLISH

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This manual applies to software version 2.2.

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1. Safety instructions

Warning notices
in this document is symbolized with a “Danger“ icon and a coloured headline.
Signal words specify the extent of this danger.
To prevent accidents, personal injuries and material damage it is imperative to strictly observe this information.

General information
in this document is symbolized with an “Information“ icon.
Signal words describe of the type of information.
This information will contribute to flawless, efficient and proper use of the product.

This document contains texts and drawings concerning the correct handling of the system and must be read before installation or use.

Observe this description’s information. Non-observing the notes, operating in non-accordance with the use requirements described below, wrong installation or handling may cause serious harm regarding people’s and plant’s safety.

The product may only be installed, connected and commissioned by qualified staff.

Externally disconnect the product before performing any operation. As the case may be, also disconnect the separately supplied output load circuits.

In case of malfunctions or uncertainties please contact the manufacturer. To prevent risks and ensure optimal performance, alterations, attachments or rebuilding of the product may not be carried out without the manufacturer’s explicit permission.

6 Safety instructions

1.1. Intended use

1.1.1. Conventional use

Xsite EASY has been exclusively designed and constructed for conventional use as described here.

- *Positioning the bucket of an excavator using gravitation sensors, laser receivers or other sensors.*
- *Indication of the measuring point's position.*
- *Comparison of the measuring point's position with various types of reference information.*

Any other use not listed here as well as any application not complying with the technical data is not conventional and inappropriate.

⚠ WARNING

Risks caused by inappropriate use!

Any non-conventional use and/or different operation of the product can lead to hazardous situations.

- Only use the product in a conventional manner.

1.1.2. Inappropriate use

- Non-conventional use
- Exceeding the limit values given on the data sheet
- Use of the product without instructions
- Use of the product beyond the limits of use
- Invalidation of safety equipment
- Removal of indicating or warning labels
- Opening, rebuilding or altering the product
- Use of the product in spite of obvious defects or damages
- Use of the product with unauthorized accessory from other manufacturers
- Use of the product at insufficiently secured construction sites

1.2. The operator’s responsibility

The product is used in the industrial sector. Therefore the operator of the product is liable to the legal responsibilities for operational safety.
Besides the operational safety instructions in this manual the safety, accident prevention and environmental protection regulations valid for the operational area of the product have to be observed.

Particularly applying:

- The operator has to inform himself/herself about the current operational safety regulations and, in a risk assessment, detect additional risks that are caused by the special working conditions at the usage site of the product. These then have to be implemented in the form of directives for the product’s operation.
- These directives have to be kept near to the product and permanently be available for the persons working with it.
- The operator has to clearly define the personnel’s responsibilities referring the appliance.
- The operator has to ensure that the instruction manual’s content is fully understood by the operating personnel.
- The statements of the instruction manual have to be observed thoroughly and unrestrictedly!
- The operator has to ensure that all maintenance, inspection and assembling processes are carried out by qualified specialized personnel, which have informed themselves sufficiently by closely studying the instruction manual.
- The operator informs the manufacturer or the authorized dealer if any safety defects occur at the product or during operation.

1.3. Special risks

⚠ CAUTION

Epilepsy warning!

Some people are susceptible to epileptic seizures or loss of consciousness when exposed to certain flashing lights or light patterns.

- Immediately discontinue use and consult a doctor if any of the following symptoms occur while using the Xsite EASY or the XD2 LED display: dizziness, blurred vision, eye or muscle twitches, loss of consciousness, disorientation or any involuntary movement or convulsion.

⚠ DANGER

Risks caused by electric current!

When working close to electricity systems, there is danger to life due to electric shock.

- Keep sufficient safety distance to electric systems.
  If working at such systems is indispensable, inform the responsible authorities before starting the working process and follow their instructions.

⚠ CAUTION

Risk of injury caused by moving machine parts!

During the controlling of the tool the machine's components and assembly groups are moved manually or automatically. Rotating and/or linearly moving components and assembly groups of the machine can cause severe injuries and material damages.

- Keep persons away from the machine's and the tool's working range respectively.
- Remove objects from the machine's and the tool's working range respectively.
- Do not interfere with the moving components during operation.
- Always switch off the product before leaving the driver's seat or when the machine is standing still.
- Do not carry out any operations at the sensorics when the system is in automatic mode.

⚠ CAUTION

Risk of injury caused by overlapping machine parts!
Subsequently assembled system components (e.g. sensors) can overlap the typical machine dimensions. This can lead to injuries and material damages.

- Ensure that the machine is operated by a qualified and experienced operator.
- Keep away persons from the machine's and the tool's working range respectively.
- Remove objects from the machine's and the tool's working range respectively.

⚠ WARNING

Risk of injury caused by malfunction!
Uncontrolled machine actions caused by the malfunction of a system component can lead to severe personal injuries in the machine's working range or cause material damage.

- Ensure that the machine is operated, controlled and inspected by a qualified and experienced operator, who has to be able to induce emergency measures e.g. an emergency stop.
- Keep away persons from the machine's and the tool's working range respectively.
- Remove objects from the machine's and the tool's working range respectively.
- Secure the construction site.

⚠ WARNING

Risk of injury caused by lacking or insufficient instruction!
Lacking or insufficient instruction can lead to operating errors or incorrect use. This can lead to severe personal injuries as well as severe material and environmental damages.

- Observe the manufacturer's safety instructions and the operator's directives.

⚠ WARNING

Risk of injury caused by insufficient safeguarding!

Insufficient safeguarding of the construction site and the component's location, e.g. of the laser emitter, can lead to hazardous situations in traffic and at the construction site.

- Ensure sufficient safeguarding of the construction site.
- Ensure sufficient safeguarding of the single components' locations.
- Observe the country-specific safety and accident prevention regulations as well as the current road traffic regulations.

NOTICE

Risks caused by faulty measurement results!

Faulty measurement results due to use of a dropped product, another illegitimate demand or an alteration can lead to severe material damages.

- Do not use obviously damaged products.
- Before reusing a dropped component carry out a check measurement.

⚠ WARNING

Risk of injury caused by unreadable signs!

In the course of time labels and symbols on the product can get dirty or get unrecognizable due to other events.

Due to immoderate mechanical effects labels and symbols can be detached.

- Always keep safety, warning and operation instructions in a well readable state.
- Regularly check the adhesiveness of the labels and symbols on the product.
- Do not remove labels and symbols from the product.

1.4. Proceeding in case of danger and accidents

Preventive measures

- Always be prepared for possible accidents or the event of fire!
- Keep first-aid-equipment (ambulance box, blankets etc.) within reach.
- Familiarize the personnel with accident notification and first-aid-equipment as well as emergency services.
- Keep the access routes clear for emergency vehicles.

If the event occurs: proceed appropriately:

- Immediately put the product out of action by using the emergency stop.
- Induce first-aid-measures.
- Recover persons out of the hazard zone.
- Inform the responsible person at the usage site.
- Alarm a doctor and/or the fire brigade.
- Keep the access routes clear for emergency vehicles.

2. Transport, packaging and storage

2.1. Transport inspection

To ensure sufficient protection during transport the products have been packed carefully.
Please immediately check the delivered goods for completeness and transport damage.

In case of external transport damage proceed as follows:

- Do not or only under reserve accept delivery.
- Record the extent of the damage on the transport documents or the transporter's bill of delivery.
- Induce complaint.
- Do not put obviously damaged products into operation.

Claim every defect as soon as it is detected. Compensation claims can only be asserted complying with the current claim periods.

2.2. Transport

When taking your equipment to the usage site or in the field always ensure that the product is transported in secured and suitable containers.
Never transport the product loosely in the car. The product's function can be severely harmed by hits and thrusts.

In case of transportation by railway, plane or ship always use the original packaging, transport containers and transport boxes or as the case may be analogical packaging. The packaging protects the product against hits and vibrations.

2.3. Storage

Only store the product in well aired, dry rooms. During storage protect it against dampness and preferably use the original packaging.

Avoid strong thermal fluctuation during storage. Incipient formation of water condensation can harm the product's function.

When storing observe the product's temperature limits; especially in summer when the equipment is stored in vehicle interiors. For the valid storage temperatures see the product's technical data.

2.4. Disposal

Packaging

During transport the products are protected ex works by special packaging, which consists of environment-friendly, easy dividable materials and are recyclable.
We recommend waste managers for the packaging disposal.

Product

The product must not be disposed together with the domestic waste. It has to be properly disposed.
Unless no agreements to take back and dispose have been made, recycle the disjointed components after disassembling them appropriately.

- Scrap metallic material rests
- Dispose electronic components according to the local regulations

⚠ CAUTION

Risk of injury caused by inappropriate disposal of the product!

When burning plastic parts toxic gases emerge that can cause illnesses.

- Dispose the product properly according to the current national country-specific disposal regulations.

Careless disposal enables unauthorized persons to improperly use the product. In doing so these persons and/or third persons can be severely injured and also pollute the environment.

- At all times protect the product against the access of unauthorized persons.

3. Product overview

Xsite EASY is a machine guidance system for excavators. It indicates the measuring point's position compared to a reference level.

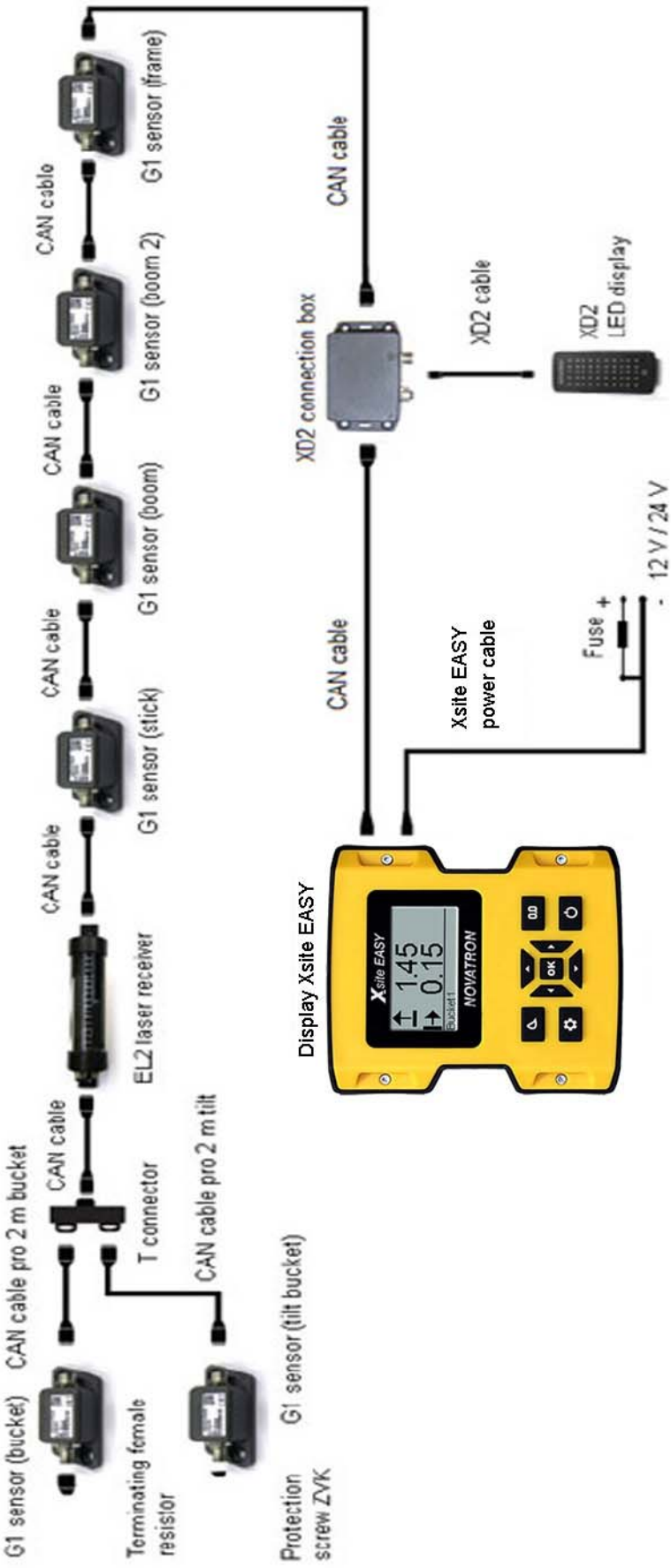
By default the system contains the following components:

- Display unit
- Connection box for LED display
- Gravitation sensors for bucket, dipper stick, main boom and frame

The system can be expanded by adding the following optional accessories:

- Tilt bucket sensor
- Dual block boom sensor
- Laser receiver
- LED display

The display is not completely waterproof. If the display or other components are taken away from the construction machine, a carrying case should be used. Make sure that the components as well as the case are clean and dry before packing.

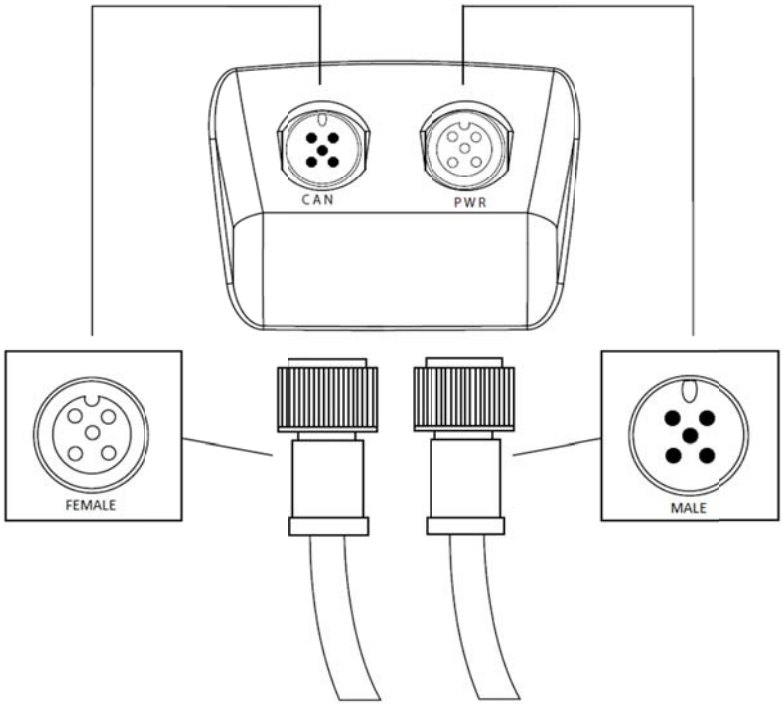

G1 sensor (bucket)
CAN cable pro 2 m bucket
Terminating female resistor
CAN cable
T connector
CAN cable pro 2 m tilt
Protection screw ZVK
EL2 laser receiver
G1 sensor (tilt bucket)
CAN cable
G1 sensor (stick)
CAN cable
G1 sensor (boom)
CAN cable
G1 sensor (boom 2)
CAN cable
G1 sensor (frame)
CAN cable
XD2 connection box
XD2 cable
XD2 LED display
Xsite EASY power cable
Fuse +
- 12 V / 24 V
Display Xsite EASY
Xsite EASY
1.45
0.15
NOVATRON
OK

4. Initial operation

This chapter provides information about connecting the cables, starting and shutting down the system, display settings and basic accuracy tests. It also introduces the detachment of the laser receiver and replacing a tilting bucket with a basic bucket.

4.1. Connecting the cables

Connect the power cable and the CAN cable to the connectors on the display's rear of the display as shown below. Then twist the connectors clockwise while pushing. The connectors are properly connected when, with medium power applied, they do not turn further clockwise. The cables are disconnected by twisting the connectors anticlockwise.

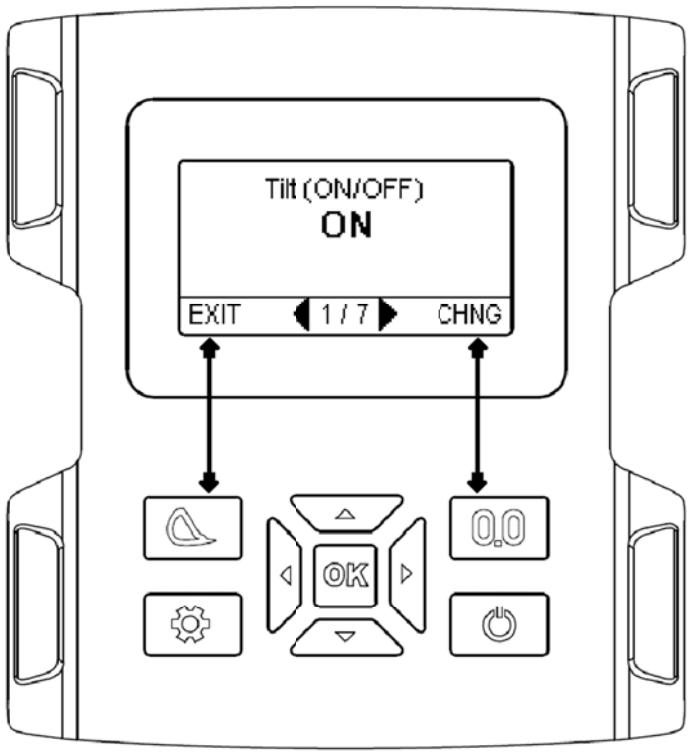


IMPORTANT!
Do not connect the CAN cable and power cable to each other since the CAN bus would be permanently powered and therefore discharge the excavator's battery.

After the cables have been connected, attach the display to the excavator's window with the suction cup. Position the display in a way that it obstructs the cabin view as little as possible.

4.2. The user interface

Xsite EASY is operated via a button interface. Use the “Bucket” button to perform the function shown at the bottom left and correspondingly use the “0.0” button to perform the function shown on the bottom right (see picture below).



4.3. The buttons

The Xsite EASY system is controlled using five function buttons and four arrow keys. The functions for the different buttons are explained in the following table.

	Arrow keys
	• Navigating within the menus • Changing the bucket measuring point while working using the left and right arrows • Changing the screen view while working using the up and down arrows • Changing the cursor position in text and number editors using the left and right arrows • Changing characters in text and number editors using the up and down arrows

	OK button	
	Press	• To accept the choice in menus and dialogs • To accept the new value/name in number/text editor
	Hold 3 sec	• To open the action dialog in wizards
	Bucket button	
	Press	• To change bucket • To cancel/go back in the menus • Left function key
	Hold 3 sec	• To set slope
	0.0 button	
	Press	• To zero the measurement values • Right function key
	Hold 3 sec	• To set the starting level
	Menu button	
	Press	• Settings
	Hold 3 sec	• Installation settings
	Power button	
	Press	• To turn ON the system • Laser/memory function ON/OFF
	Hold 3 sec	• To turn OFF the system

4.4. Switching the system ON/OFF

Turn the system ON by pressing the “Power” button. When the XD2 light bar powers up, the LED on the bottom right corner blinks.

The sensors are equipped with an internal heating. When the excavator is used at cold temperatures, it takes time for the sensors to warm up and provide satisfying accuracy.
The time needed between switching ON the system and starting to work is shown in the table below. Allow sufficient warm-up time to ensure accurate measurement results.

Temperature	**Heating time**
-20°C	~20 min
-10°C	~10 min
-5°C	~5 min

The system is turned OFF by pressing and holding the “Power” button for 3 seconds.

4.5. Display settings

In the following the different settings found under “Display unit settings” are described.
See the chapter “User interface” for instructions on how to change the settings.

4.5.1. Brightness

The display’s brightness can be set in “Main menu” → “Display unit” → “Display” → “Brightness”. Choose between bright, medium and dim.

4.5.2. Sound settings

The sound can be adjusted in “Main menu” → “Display unit” → “Sounds”.
Select which laser, target and button sounds are ON by pressing the corresponding “OK” buttons. The volume can be switched to high, low or muted.

4.5.3. Power button function

The short cut function of the “Power” button can be adjusted in “Main menu” → “Display unit” → “Buttons”.
Choose between the option to switch the laser ON or OFF by pressing “OK” in the “Laser” selection or to use the memory function by pressing “OK” in the “Memory” selection. Please also see the chapters “Moving the excavator with the laser receiver” and “Moving the excavator via the memory function”.

4.5.4. Date and time

The date and time can be changed in “Main menu” → “Display unit” → “Date and time”. Select the 1/2 page to adjust the time and the 2/2 page to adjust the date. The digit order for the date is year, month, day.

4.5.5. Language

Select the option language in “Main menu” → “Display unit” → “Language”. Select the favoured language and press the “OK” button to confirm the change. After the language has been chosen, press any key for the system to shut down. Turn the system ON again by pressing the “Power” button.
Regardless of the chosen language, the language selection can always be accessed as follows: press the “Main menu” button → press the “Down arrow” until the last selection is chosen (at the bottom) → press “OK”. The language menu opens.

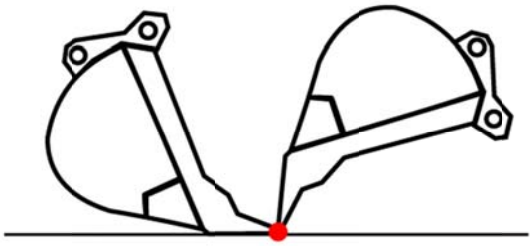
4.6. Accuracy check

The system accuracy should always be tested before starting any operation. The following procedures provide an easy way to do so.

During the test, all machine parts (bucket, stick, boom) should move to achieve a 100 % certainty for the system accuracy.

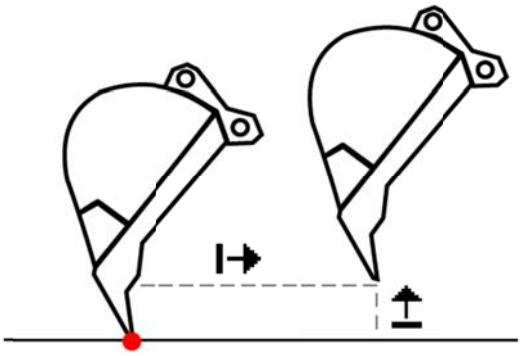
4.6.1. Depth and distance accuracy test 1

1. Place the bucket on a reference point and zero the measurement value.
2. Without tilting it sideways turn the bucket to a different position and place it on the same point again.
3. The depth and distance readings should be close to zero in every position (with a permissible accuracy tolerance of +/- 1 cm).



4.6.2. Depth and distance accuracy test 2

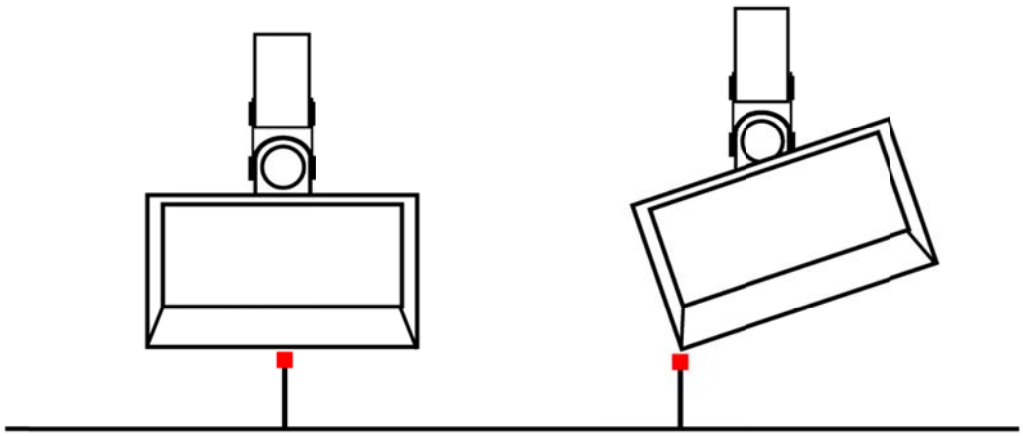
1. Place the bucket on the ground and zero the measurement value.
2. Move the bucket and use a tape measure to measure the depth and distance difference between the bucket measuring point and the zeroed point.
3. The system should indicate the same readings with an accuracy tolerance of +/- 1 cm.



4.6.3. Tilt bucket accuracy test

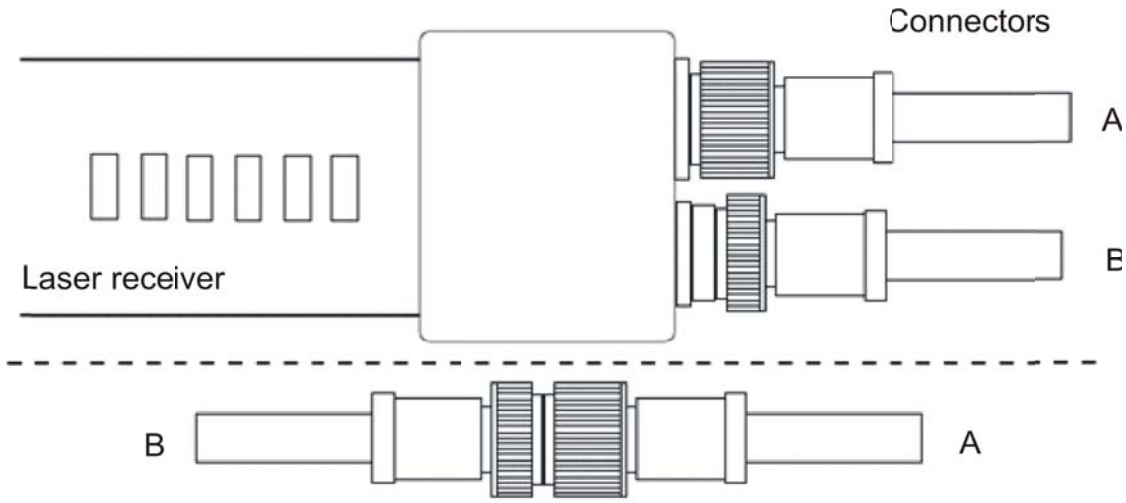
When using the tilt function, test the accuracy of the bucket edges (see picture below).

1. Straighten the tilt rotator.
2. Switch the measuring point to centre and select a measurement mode showing depth and distance.
3. Align the bucket blade to a horizontal level and move the centre of the bucket to the reference point. Zero the depth and distance readings by pressing the “0.0” button.
4. Tilt the bucket and put the left corner on the reference point. Change the measuring point to the lowest corner.
5. Depth and distance readings should be “0.00” in every position (make sure that the correct measuring point is in use).
6. Repeat this accuracy test with the other bucket corner.
7. In case the accuracy is worse than +/- 2 cm carry out a tilt bucket calibration (see chapter “Tilt bucket calibration”).



4.7. Detaching the laser receiver

It is recommended to detach the laser receiver when not being used, for example when carrying out work where there is a risk of damaging the laser receiver, such as dredging.
When removing the laser receiver, be sure to connect the detached cables together afterwards. Apply a small amount of anti-corrosion gel or grease onto the cable's connector parts to prevent water ingress.



Always remember to apply anti-corrosion gel or grease onto the connectors (e.g. SuperLube® Anti-Corrosion Gel).

4.8. Replacing a tilt bucket with a non-tilting bucket

Detach the cable connecting the tilt bucket sensor, apply grease to the cable connector and attach a cap to protect the connector.

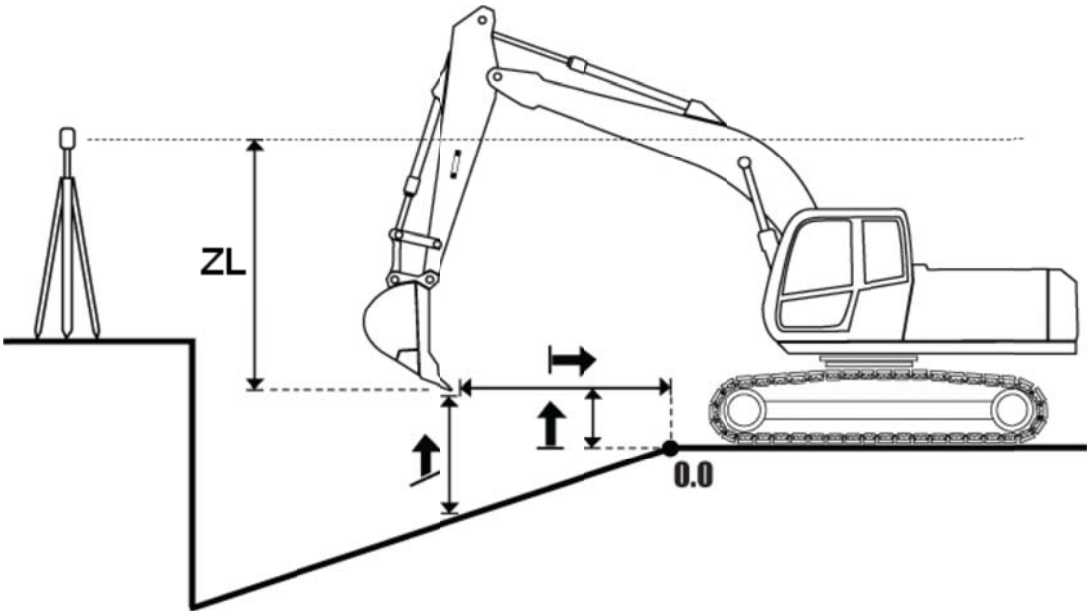
Select the bucket to be used from “Main menu” → “Buckets” and go to “Tilt calibration”. The page 1/7 serves to switch the tilt function ON or OFF. If the tilt function is ON, press the “0.0” button to switch it OFF.

Always remember to apply anti-corrosion gel or grease onto the connectors (e.g. SuperLube® Anti-Corrosion Gel).

5. Applications

5.1. Measurement mode

Screen views with different measurement symbols can be changed with the up and down arrow keys. In the picture below four of the most commonly used measuring functions are shown. “0.0” indicates the point where the bucket has been zeroed. The following table lists all symbols.



	Depth
	Height from the zero point to the bucket measuring point
	Distance
	Horizontal distance from the zero point to the bucket measuring point
	Slope
	Height from the target surface to the bucket measuring point
ZL	**Laser jobsite height**
	Height of the bucket measuring point compared to laser jobsite height
	Bucket figure side view
	Illustration of the bucket angle viewed from side
T°	**Bucket tilting angle in degrees**
	Angle of the tilt bucket compared to horizontal level in degrees
T%	**Bucket tilting angle in percent**
	Angle of the tilting bucket compared to horizontal level in percent
R°	**Machine roll in degrees**
	Angle of the side tilt of the cabin in degrees

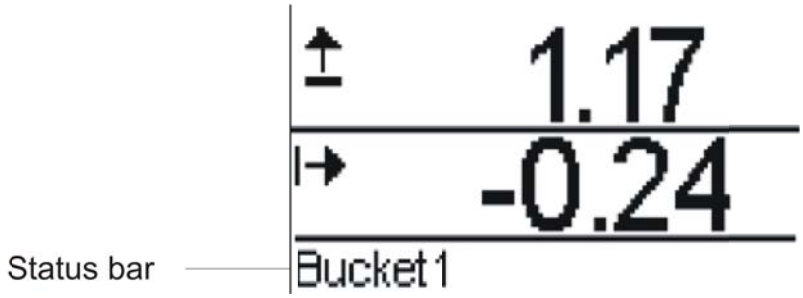
R%	**Machine roll in percent**
	Angle of the side tilt of the cabin in percent
B°	**Bucket angle in degrees**
	Angle of the bucket compared to the calibrated plumb line
P°	**Machine pitch in degrees**
	Angle of the forward and backward tilt of the cabin in degrees
P%	**Machine pitch in percent**
	Angle of the forward and backward tilt of the cabin in percent
CL	**Digital clock**
	Shows the time
CLa	**Analogue clock**
	Traditional alternative to the digital clock
BFR	**Bucket figure front view**
	Illustration of the bucket angle viewed from front
S%	**Slope percentage**
	Slope percentage from the zero point to the bucket measuring point
F°	**Pitch angle for flat bucket or drill/pile attachment in degrees**
	Angle of the bucket's forward and backward tilt in degrees
F%	**Pitch angle for flat bucket or drill/pile attachment in percent**
	Angle of the bucket's forward and backward tilt in percent
X°	**Roll angle for flat bucket or drill/pile attachment in degrees**
	Angle of the bucket's side tilt in degrees
X%	**Roll angle for flat bucket or drill/pile attachment in percent**
	Angle of the bucket's side tilt in percent

5.2. Screen views

Four preset screen views and two optional screen views can be edited by pressing the "Menu" button and selecting "Screen views".
First select either "Custom1" or "Custom2", then choose the layout type. There are six different layout types with up to four different components being displayed at the same time.
The components can be set in "Custom1" and "Custom2" → "Components". You can choose from a total of fourteen different components (see table above). Optional screen views can be switched off by selecting the blank "_" value for the first layout component.

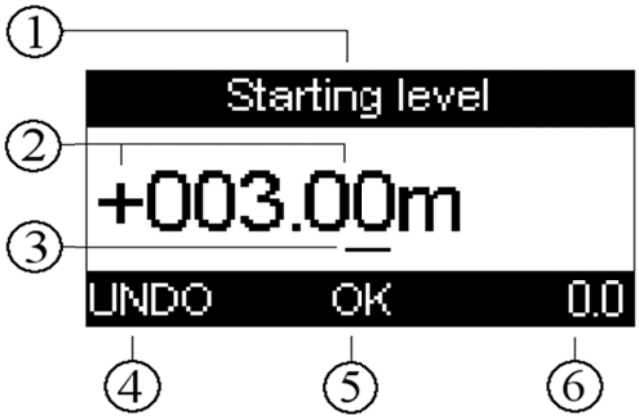
5.3. Status bar

Below the measurement data the status bar is displayed, which can show the name of the active bucket, measurement point or laser status (see picture below).
What is shown in the status bar can be set in “Main menu” → “Screen views” → “Status bar”. Press the “OK” button to switch the selected option (Laser, Measurement point or Bucket name) ON or OFF. If more than one option is switched ON, the selected options alternate in the status bar.



5.4. Number editor

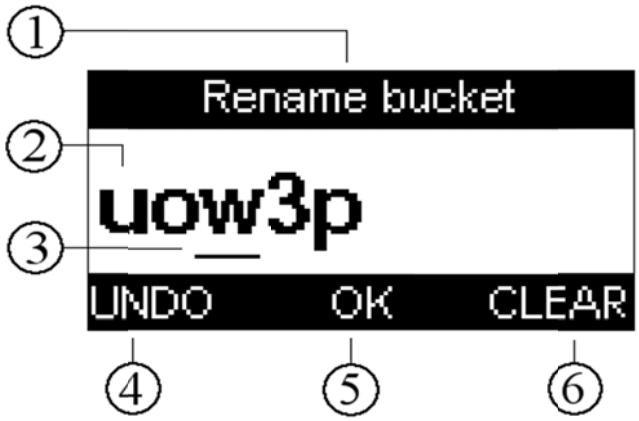
When entering numbers in certain menus (such as the bucket length or the jobsite height), use the left and right arrow keys to select the number to be changed and use the up and down arrows to choose the correct number for the current selection. Press the “0.0” button to set the numerical value to “0.00”. Accept the new value with the “OK” button or undo the changes with the “Bucket” button.



1 Title
2 +/- Symbols and the numerical value
3 Active number or +/- character
4 Undo the changes using the “Bucket” button
5 Accept the changes using the “OK” button
6 Zero the numerical value

5.5. Text editor

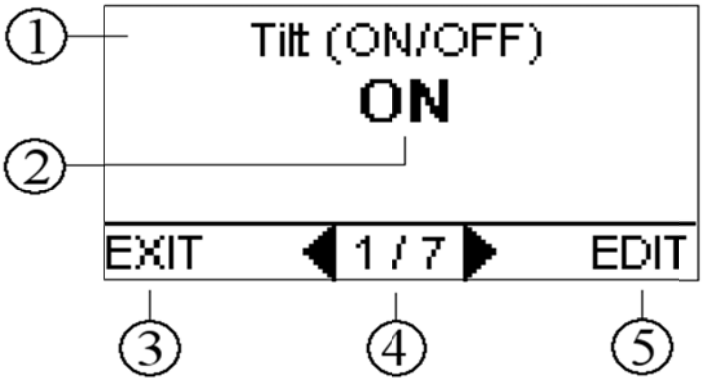
Text is entered the same way as numbers.
Use the left and right arrow keys to select the character to be changed and use the up and down arrows to choose the correct character/symbol for the current selection. By pressing the “0.0” button the selected character is cleared. Accept the changes with the “OK” button or undo the changes with the “Bucket” button.



1 Title
2 Characters
3 Active character
4 Undo the changes with the “Bucket” button
5 Accept the changes with the “OK” button
6 Clear the selected character

5.6. Wizards

With the left and right arrow keys the wizard menus are browsed through. Use the “Bucket” button to perform the function shown on the bottom left, and correspondingly use the “0.0” button to perform the function shown on the bottom right. By pressing and holding the “OK” button for three seconds the action dialogue is opened, from where it is also possible to execute the commands available in the selected wizard menu. Use the up and down arrows to select the favoured command and accept the selected choice with the “OK” button.



1 Title
2 Status
3 The “Bucket” button function
4 Number of the wizard page
5 The “0.0” button function

5.7. Menus

Press the “Menu” button to enter the main menu. Use the up and down arrow keys to select the favoured option and press the “OK” button to proceed. Note that many menus have more than three options, not all visible at the same time. Press the “Bucket” button to go back in the menus. By pressing the “Bucket” button in the main menu, the measurement mode can be called up and changed.

1 Title
2 List of options
(The highlighted part is the active selection.)
3 Bar indicating the position

6. Bucket settings

6.1. Changing the bucket and the measuring point

To change the bucket

1. Open the bucket selection list by pressing the “Bucket” button.

2. Choose the favoured bucket on the list and press either “OK” or the right arrow button.
3. Select the correct measuring point.

NOTE!
For instructions on working with a new or an outworn bucket or changed measurements see chapter ”Adding/ editing/ calibrating the bucket”.

While working the measuring point can be changed with the left and right arrow keys. Choose left, centre, right or automatic measuring point. In case the automatic mode has been chosen, the system selects the bucket’s lowest point as measuring point when the bucket blade is tilted over 3 degrees. In case the bucket blade is tilted less than 3 degrees, the system selects the bucket centre as measuring point.

The current bucket and the measuring point are shown in the status bar.

6.2. Adding/ editing/ calibrating the bucket

NOTE!

Before a new bucket can be used, it has to be calibrated. In case a bucket is worn out or the measurements have changed, recalibration is necessary.

Always check the bucket's measuring accuracy after the calibration.

To select an existing bucket for editing, go to "Main menu" → "Buckets" and choose the favoured bucket.
To create a new bucket, go to "Main menu" → "Buckets" and choose "<New bucket>" from the bottom of the list. To create a bucket with no preset values, select "Blank values".
To copy values from an existing bucket, select "Copy existing" and select the favoured bucket from the list.

Bucket settings:

Measures	Entering or changing the bucket's measurements
Calibration	Performing the bucket calibration
Name	Changing the bucket name
Tilt calibration	Running the tilt calibration wizard (includes bucket calibration)
Type	Choosing the bucket type
Angle calibration	Performing the angle calibration (only shown when bucket type is "Flat" or "Drill/Pile")
Remove	Deleting the selected bucket

The buckets need to be calibrated either via a normal bucket calibration or a tilt calibration. Which one of these calibrations has to be carried out depends on the circumstances outlined in following table.

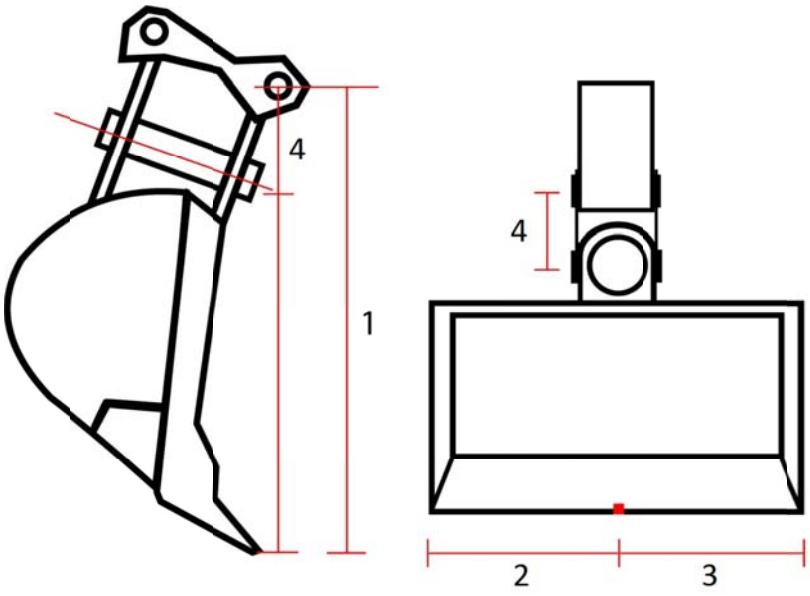
Bucket calibration	• A new bucket has been added that does not tilt sideways. • A new bucket has been added that tilts sideways, whose tilt calibration parameters have to be copied from an existing bucket.
Tilt calibration	• A new bucket has been added that tilts sideways, whose tilt calibration parameters are not copied from an existing bucket. • A new bucket has been added that tilts sideways, whose tilt calibration has not been carried out. • The tilting part (e.g. tilt rotator or tilting quick coupler) has been changed.

The tilt calibration wizard includes a bucket calibration.

When the bucket type “Flat” or “Drill/Pile” are chosen, the standard bucket and angle calibration has to be carried out as described in the following chapters.

6.2.1. Bucket measurements

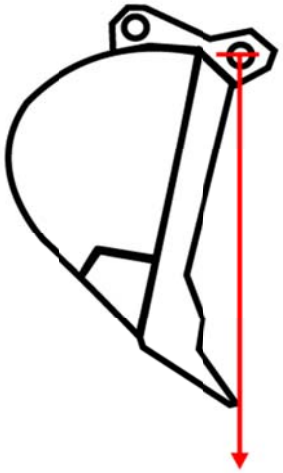
Add/ edit the bucket measurements in “Main menu” -> “Buckets”, select the correct bucket and “Measures”. Measure and enter the “Length”, “Left Width”, “Right Width” and “Horizontal distance” (4 Quick coupler) parameters.
In case the bucket does not tilt sideways the “Horizontal distance” value is not required.



1 Length
2 Left width
3 Right width
4 Quick coupler

6.2.2. Bucket calibration

To carry out a bucket calibration, select “Calibration” in the bucket settings. The bucket calibration requires a calibration magnet and a plumb line. Set the plumb line on the lowest pivot pin of the stick. Turn the bucket slowly towards the plumb line. When the bucket’s tip touches the string without moving it, keep the bucket steady and press the “CALIB” button. After a few seconds the calibration is complete.



IMPORTANT!
After the calibration it is essential to test the bucket accuracy. Perform an accuracy test as described in the chapter “Accuracy check”. If the accuracy is less than +/- 1 cm, recalibrate the bucket.

6.2.3. Tilt bucket calibration

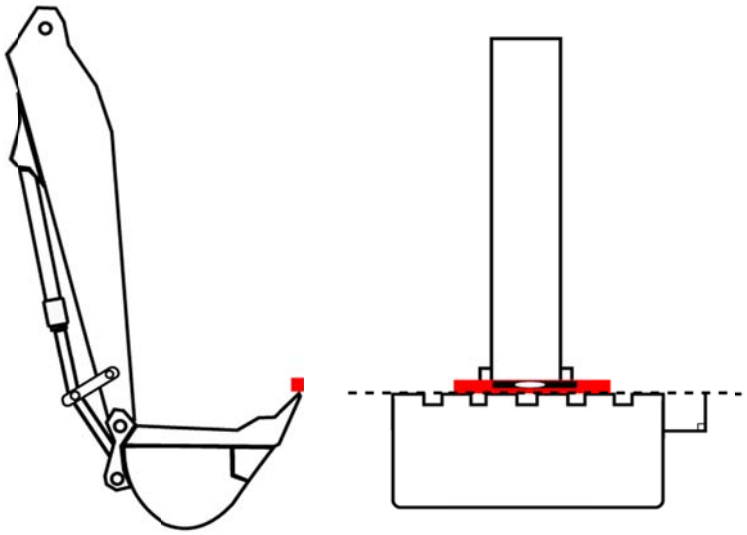
With the tilt calibration the part between the bucket and stick that tilts sideways (e.g. tilt rotator, tilting quick coupler) is calibrated.

> *In case the calibration data is copied from an existing calibrated bucket, a new calibration is not necessary.*
>
> *However, the accuracy test should still be performed as described before.*

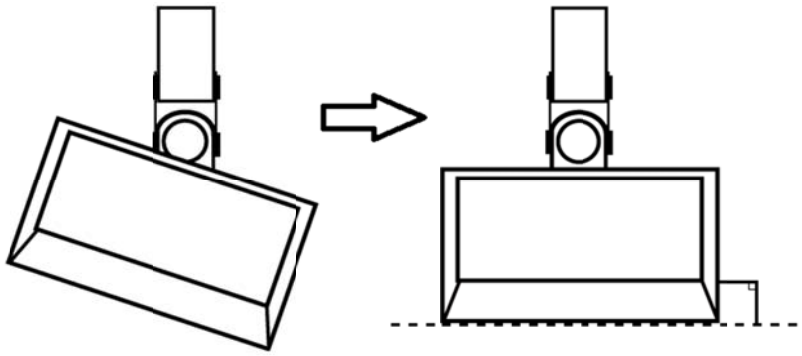
To carry out a tilt calibration, go to “Main menu” and select “Buckets”. Create a new bucket or choose an existing bucket from the list. Then select “Tilt calibration” in the bucket settings menu.

Carry out the tilt bucket calibration as follows:

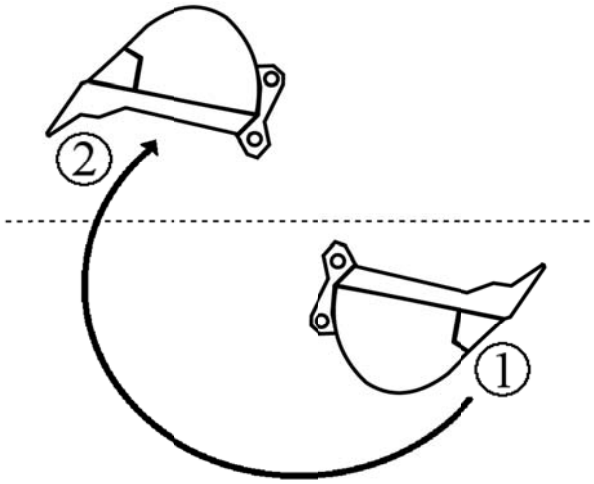
1. Switch the tilt bucket ON by pressing the “0.0” button.
   In case the tilt function is not used, switch the tilt bucket OFF in this menu after the calibration has been carried out.
2. Drive the machine to a flat surface and let it rotate until the roll value is close to zero (until the “Turn!” text changes to “OK!”).
3. Straighten the tilt rotator. Do so by turning the bucket in and straightening the tilt rotator with a spirit level as shown below.



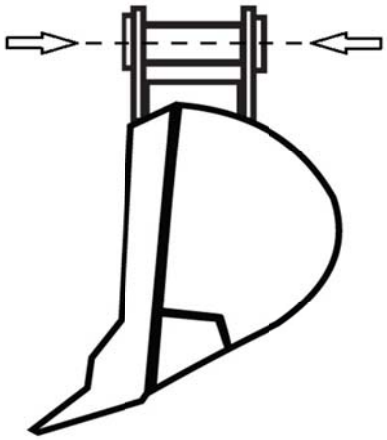
4. Align the bucket to a horizontal level as shown below.



5. Perform the bucket calibration using a plumb line (see “6.2.2 Bucket calibration”).
6. Turn the bucket in, press “CALIB” and turn the bucket by approx. 180 degrees (see drawing below).
   Then press “CALIB” again to accept the calibration.



7. Turn the tilting axis to a horizontal level and press “CALIB”.



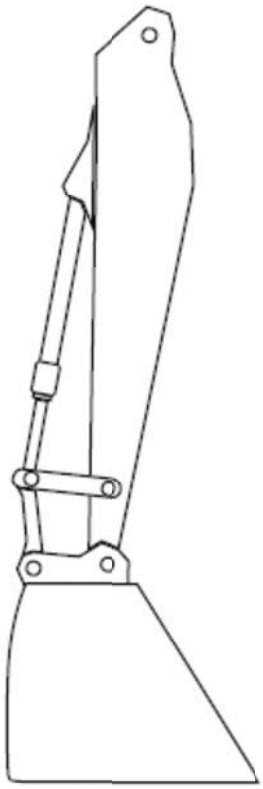
8. If the tilt calibration has been successfully completed, press the “Bucket” button twice to save the settings. Finally test the accuracy as described in the chapter “Accuracy check”.

6.2.4. Bucket name

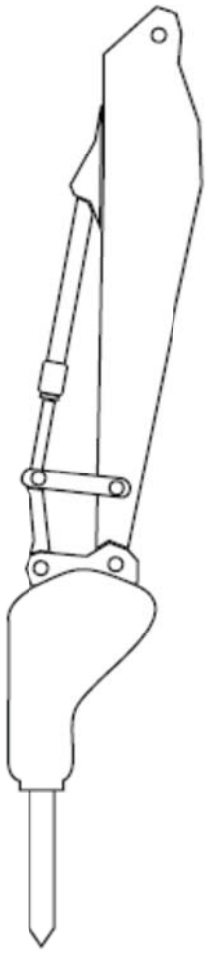
The bucket name can be set in “Main menu” → “Buckets” → old/new bucket → “Name”. Either choose a preset bucket name from the list (page 1/2) or rename the bucket (page 2/2). Also see chapter “Text editor”.

6.3 Angle calibration

When using a flat-bottomed bucket, the operator can measure the angle of the bucket's bottom. When using a drill/pile attachment, the operator can measure the angle of the attachment.
An angle calibration can only be done if the bucket type is "Flat" or "Drill/Pile".



Flat-bottom bucket



Drill/Pile attachment

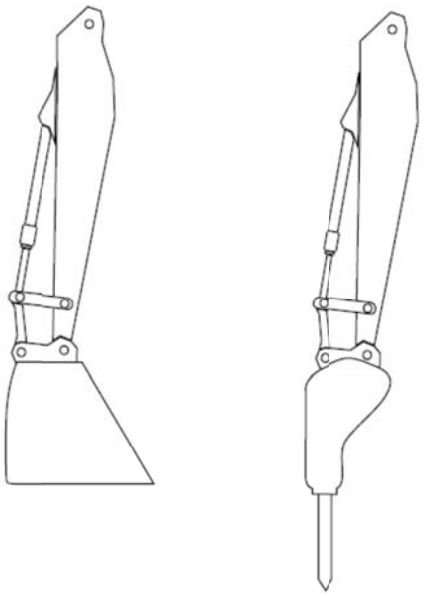
The bucket type can be chosen in "Main menu" → "Buckets" → old/new bucket → "Type".

To carry out the bucket angle calibration, go to "Main menu" and select "Buckets". Create a new bucket or choose an existing bucket to be calibrated from the list. Then select "Angle calibration" from the bucket settings menu.

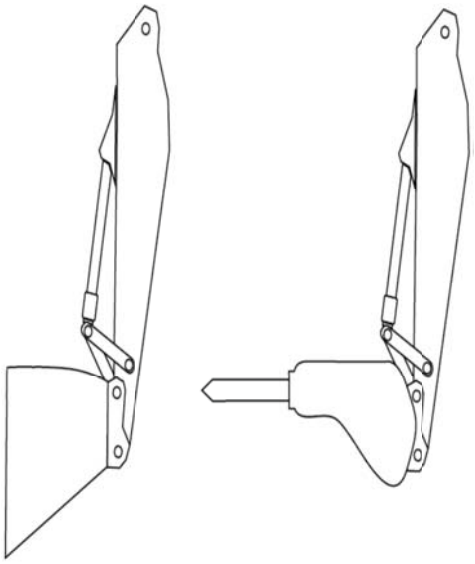
Carry out the calibration as follows:

1. Drive the machine to a flat surface and rotate the machine until the roll value is close to zero (until the “Turn!” text changes to “OK!”).

2. Choose the calibration orientation.
   In “Normal” orientation the bottom of the flat bucket is aligned horizontally while the drill/pile attachment is aligned vertically.
   In the “90 degrees” orientation the bottom of the flat bucket is aligned vertically while the drill/pile attachment is aligned horizontally.



“Normal” orientation



“90 degrees” orientation

3. Press “CALIB”. After this step the angle calibration is complete. Go back with the “Bucket” button and save the settings.

After the angle calibration, test the accuracy by placing the bucket on a known surface. The F and X readings should be consistent with the actual surface. Alternatively, also a spirit level or a point laser can be used to test the accuracy.

7. Depth measurement

7.1. Depth measurement from a reference point

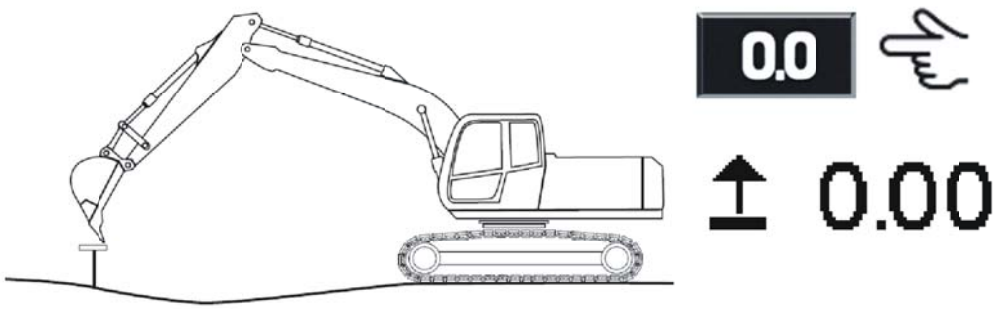
Check the system accuracy before starting to operate (also see “Accuracy check”).

The depth from a reference point can be measured in two different ways:

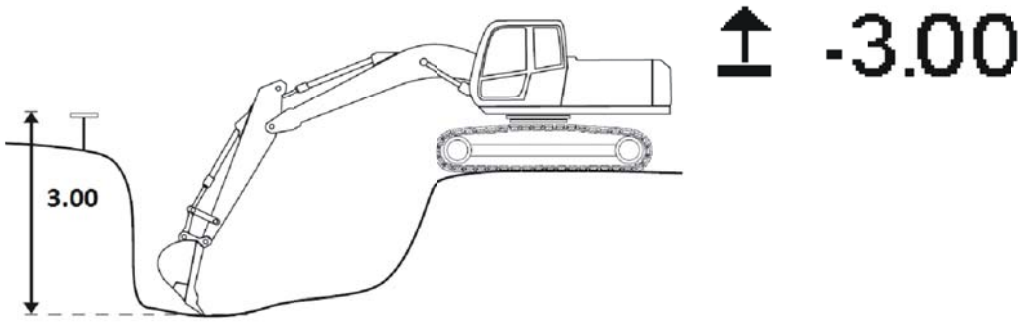
Digging from zero level	The measurement value is zeroed at the starting point. The display shows the bucket depth compared to the zero level.
Digging with a known starting level	The height difference between the starting point and the target level is set as the starting level. When the measurement value is zeroed, the starting level value appears on the screen. When moving the bucket towards the target level, the reading on the screen decreases and finally shows zero when the target level has been reached.

7.1.1. Digging from the zero level

When digging from the zero level, set the bucket at the favoured level or starting point (the stake for example) and then press the “0.0” button. The reading “0.00” appears on the screen.



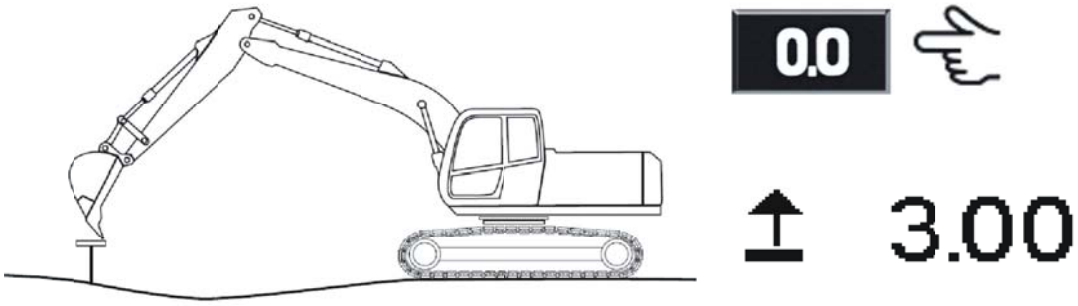
Measure the depth with the bucket. The system shows the depth of the measuring point compared to the zero level. The value above the zero level is positive while the value below the zero level is negative.



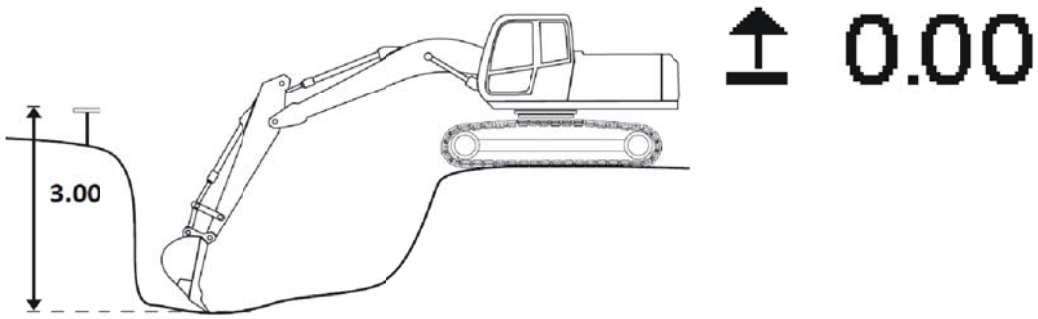
7.1.2. Digging with a known starting level

Set the height difference between the starting point and the target level as the starting level (3.00 m in the example) in “Main menu” -> “Starting level”. Use the arrow keys to set the favoured height and press “Save”. You can also set the starting level by pressing and holding the “0.0” button in the measurement mode for three seconds.

Move the bucket to a stake or another reference point. Zero the measurement value by pressing the “0.0” button. The starting level (“3.00” in this example) appears on the screen.



During the digging process the value decreases. The target level has been reached when the reading is “0.00”.



7.1.3. Moving the excavator when measuring the depth

When the excavator is moved, its height continuously changes. To maintain the original reference level, the bucket has to be taken to a predefined reference point again or a rotating laser has to be used as reference.

NOTE!

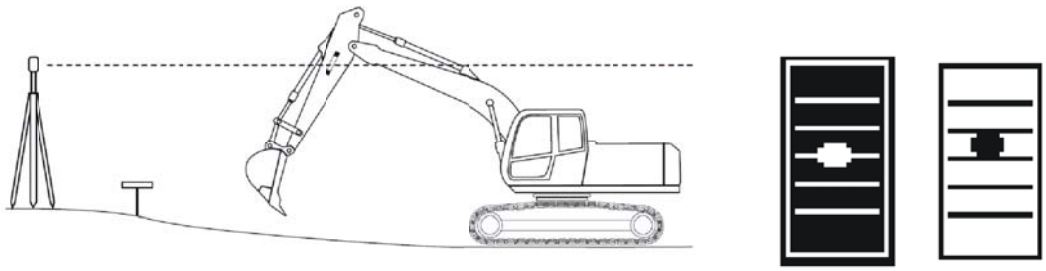
When moving the excavator it is recommended to use a laser receiver to achieve the best accuracy.

Moving the excavator with the laser receiver:

When the excavator is moved to a new place and the depth is being measured, a rotating laser has to be set to a horizontal level.

Set the laser transmitter to a horizontal level at any height. Go to “Main menu” → “Laser”. Press the “Right arrow” button twice to enter page 3/3 and switch ON the laser. The laser can also be controlled with the “Power” button. Pressing the “Power” button turns the laser “ON” or “OFF”.

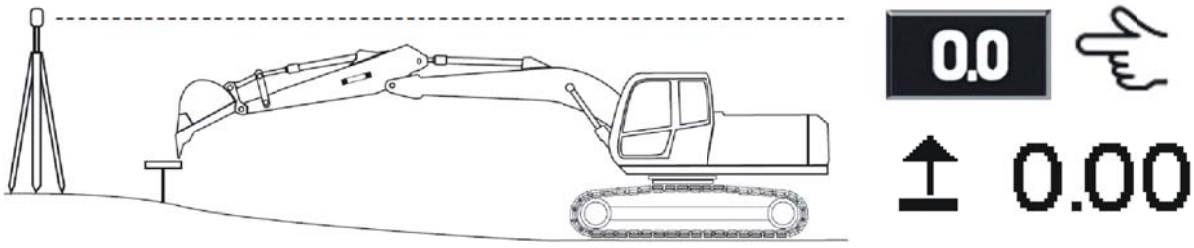
Move the boom slowly in a way that the laser receiver hits the laser beam. It is recommended to move the dipper stick to a position as upright as possible when reaching the laser beam. The laser receiver symbol on the screen indicates laser hits. The laser hit has been accepted when the text “Hold!” changes to “Hit accepted!” and the black background changes to a white background as shown below.



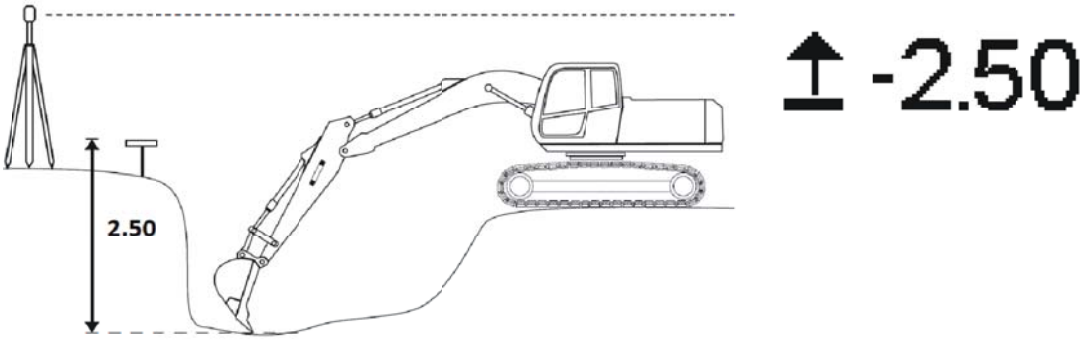
NOTE!

Be sure to use the correct laser transmitter if there is more than one at the jobsite!

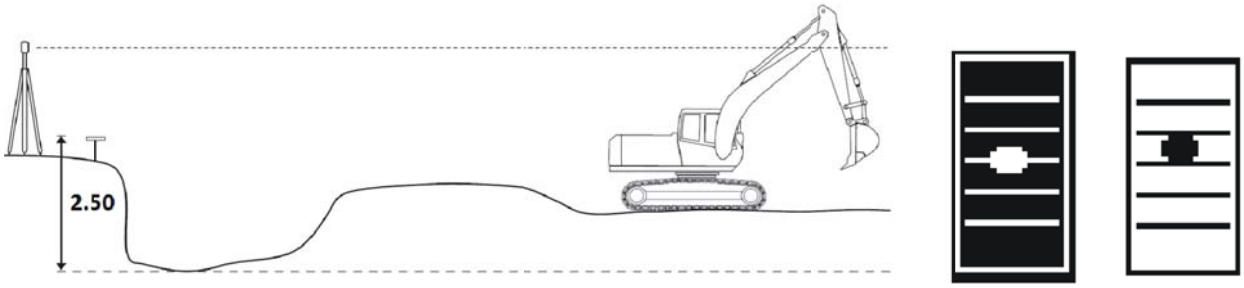
Move the bucket to a stake or another reference point. Zero the measurement value by pressing the “0.0” button (“Starting level” = “0.00” in the example).



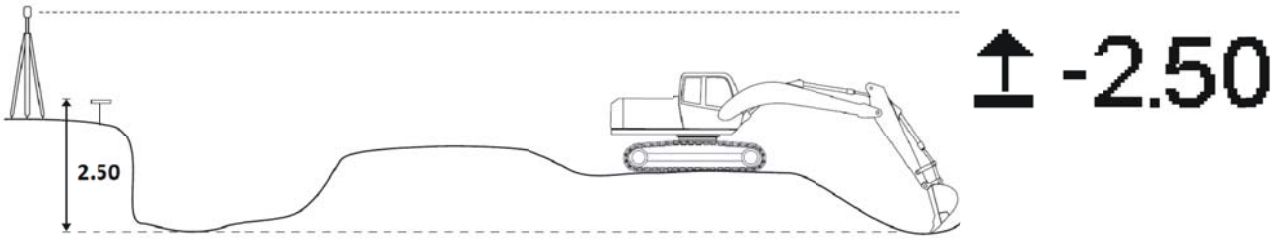
Measure the depth.



Move the excavator to a new place. Then move the laser receiver to the beam as shown below. It is recommended to move the dipper stick to a position as upright as possible when reaching the laser beam and to make sure that the laser beam is not covered by machine parts.

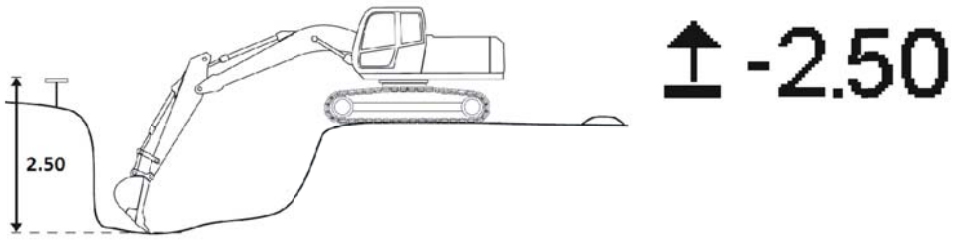


After the laser hit has been received, the digging process can be continued. The depth is measured compared to the original reference level, even though the altitude of the excavator might have changed (see picture below).

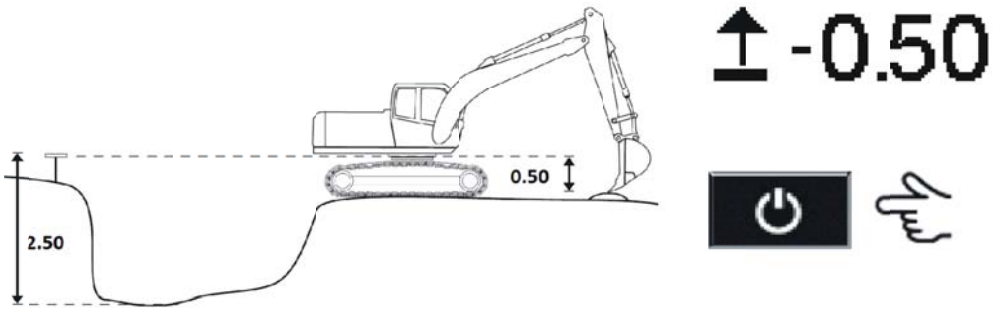


Moving the excavator using the memory function:

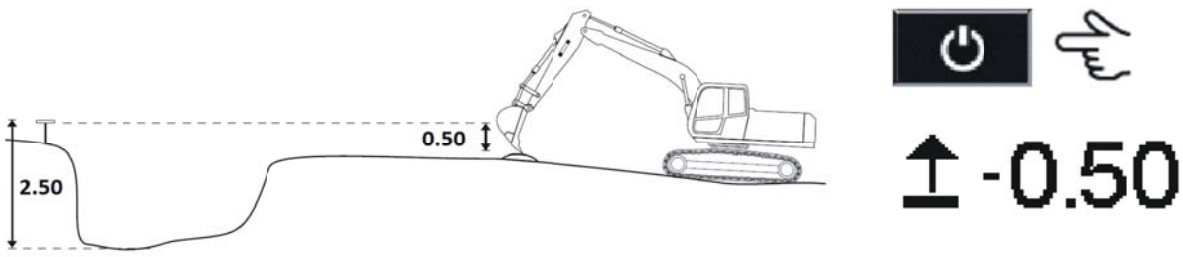
When measuring the depth, the excavator can be moved via the memory function. Switch on the memory function in “Main menu” → “Display unit” → “Buttons” and press the “OK” button in the “Memory” selection. Measure the depth. In the example, the bucket has been zeroed on the stake with a “Starting level” value of “0.00”.



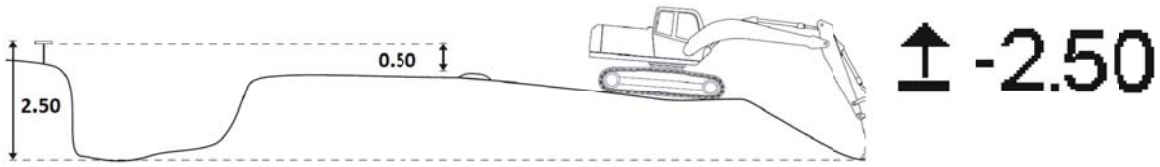
Before moving the excavator, move the bucket to a fixed point (e.g. the stake). Save the altitude of the fixed point to the memory by pressing the “Power” button. The text ”MEMORY” appears on the screen and the memory function is activated.



Move the excavator to a new place and move the bucket to the fixed point. Release the saved height value by pressing the “Power” button again. The “MEMORY” text disappears.

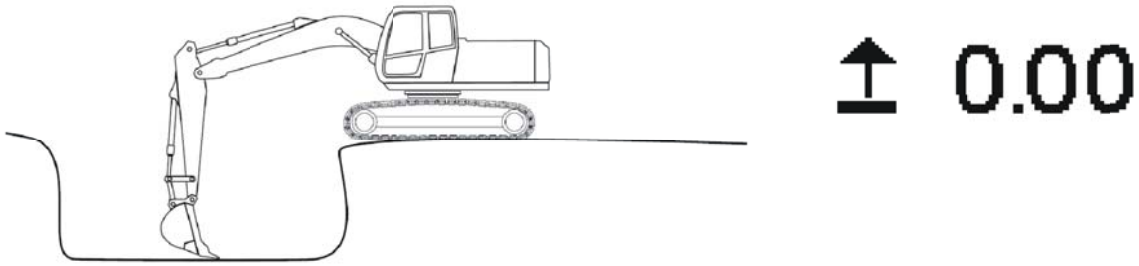


The digging process can be continued. The depth is measured compared to the original reference level, even though the altitude of the excavator might have changed.

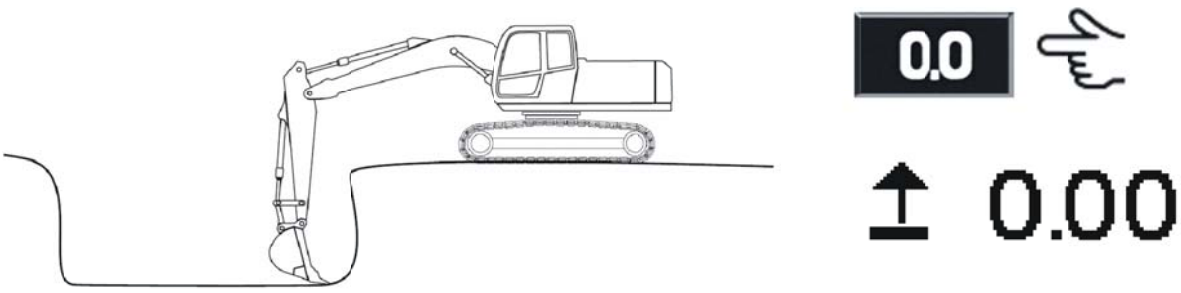


Moving the excavator using the zero function:

When measuring the depth, the excavator can be moved to continue the digging process at the same depth (e.g. when digging a foundation) with the help of the zero function. Measure the depth. In the example, the “Starting level” is “0.00”.



Move the machine to a new place, i.e. to a point where the digging process can be continued. After the excavator has been moved, reach to the measuring point on the completed surface and zero the measurement value by pressing the “0.0” button. After zeroing, the digging process can be continued.



7.2. Depth measurement from the laser jobsite height

The laser jobsite height function requires a rotating laser that has been set to a known height. Set the rotating laser to a horizontal level.

NOTE!

It is recommended to use the fastest laser rotation speed possible.

Go to “Main menu” and select “Laser”. Press the “Right arrow” button twice to enter page 3/3 and switch the laser ON. It is also possible to control the laser via the “Power” button.

The laser jobsite height function can be used for depth measurement in two different ways:

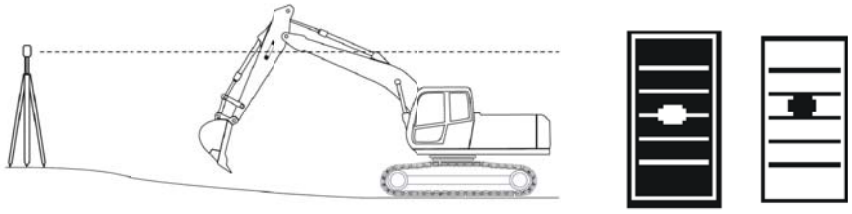
Jobsite height is “0.00”	ZL value indicates the height from a laser beam to the bucket’s measuring point
Jobsite height is the absolute height of the laser beam	ZL value indicates the absolute height of the bucket’s measuring point

To set the jobsite height go to “Main menu” → “Laser” and press “EDIT” in “Jobsite height”. Enter the favoured height and press “ACCEPT”.

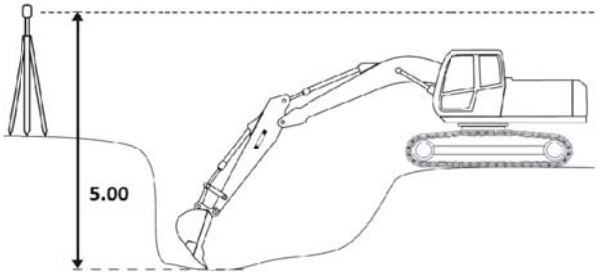
NOTE!

In case the XD2 LED display is used, the jobsite target height can be adjusted in “Main menu” → “Laser” → page 2/3 “Jobsite target height”. See chapter “Target levels” for further information.

Slowly move the boom in a way that the laser receiver hits the laser beam. It is recommended to move the dipper stick to a position as upright as possible when reaching the laser beam. The laser receiver symbol on the screen indicates laser hits. The laser hit has been accepted when the text “Hold!” changes to “Hit accepted!” and the black background changes to a white background.

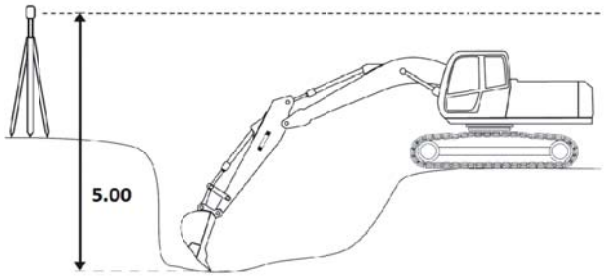


When the beam has been accepted, the ZL value indicates either the height difference between the bucket and the laser beam (“Jobsite height” = “0.00”)…



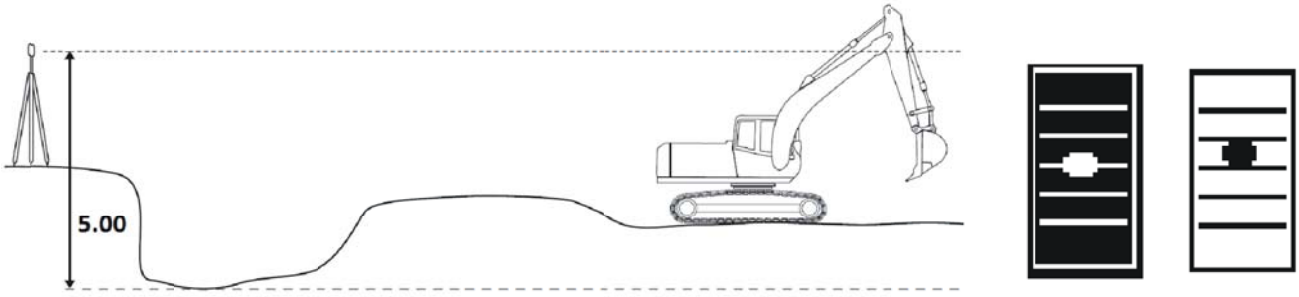
ZL-5.00

…or the absolute height of the bucket (“Jobsite height” = “30.00”).

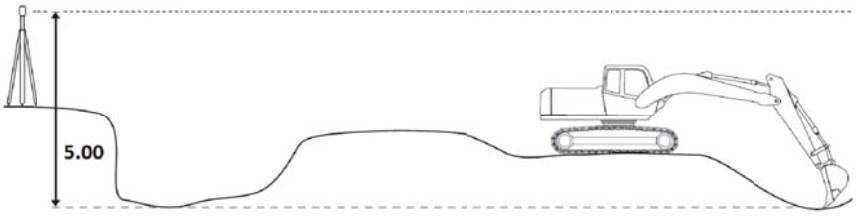


ZL 25.00

When moving the excavator, the laser receiver has to be taken to the laser beam again.



The digging process then can be continued and the depth is measured compared to the original reference level, even though the altitude of the excavator might have changed.



8. Slope measurement

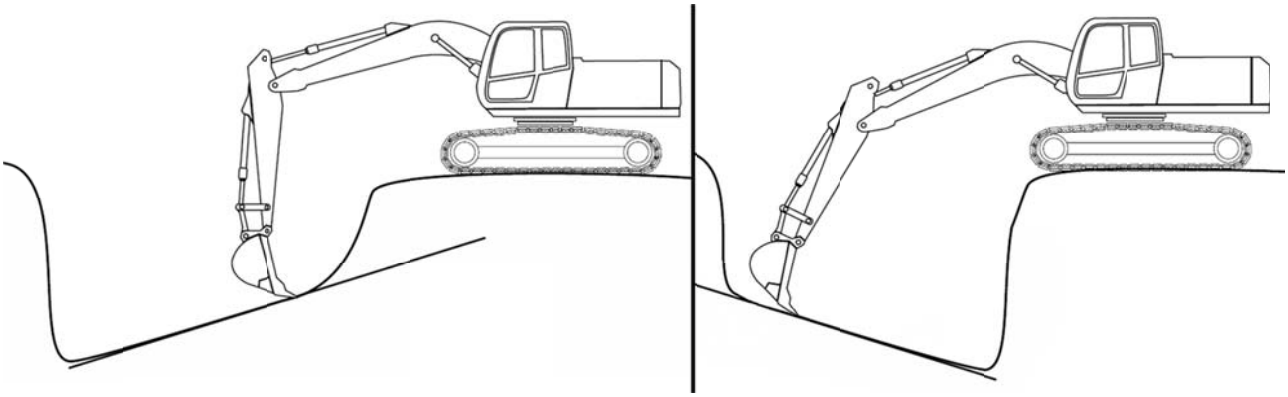
Check the system accuracy before starting to operate (also see "Accuracy check").

The slope can be measured in two different ways:

Slope digging from zero level	The slope's starting level is set to "0.00". The reading is zeroed at the slope's starting point. The display shows the height of the measuring point compared to the target grade.
Slope digging with a known starting level	The height from the starting point to the target level is set for the slope's starting level. When the measurement value is zeroed, the slope's starting level appears on the screen. When moving the bucket towards the target level, the reading on the screen decreases and finally shows zero when the target level has been reached.

8.1. Creating/ editing a slope

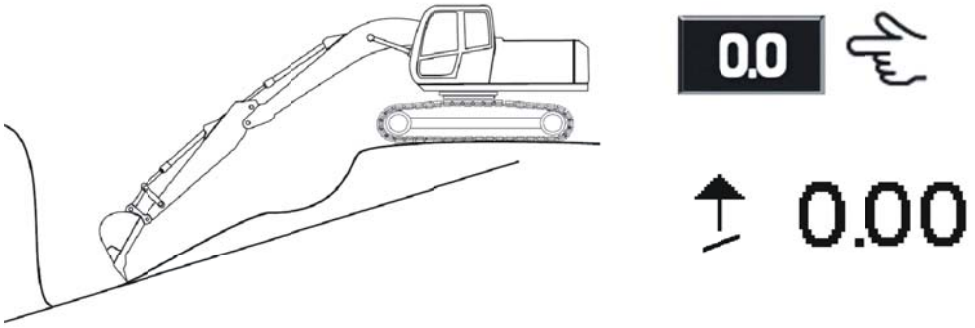
When measuring slopes, select a screen view that shows the "⏄" icon. Choose the slope unit by selecting "Main menu" → "Slope" → "LIST". Choose "Percent", "Fraction" or "Degrees". For example, a +10% slope is about 5.7° in degrees and 1/10 in fractions.
To edit the slope go to "Main menu" → "Slope" and press "Right arrow", or press and hold the "Bucket" button for three seconds when in measurement mode. Adjust the slope by selecting "EDIT" and setting the slope rate. Selecting a negative (-) slope creates a downhill slope while selecting a positive (+) slope creates an uphill slope.



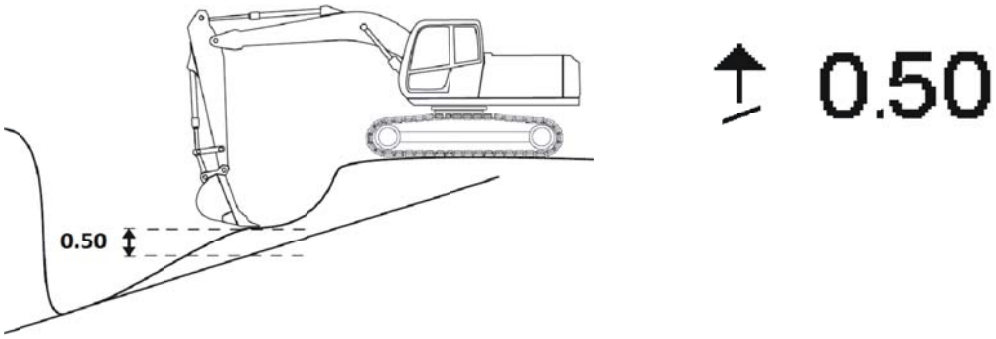
negative Slope positive Slope

8.2. Slope digging from the zero level

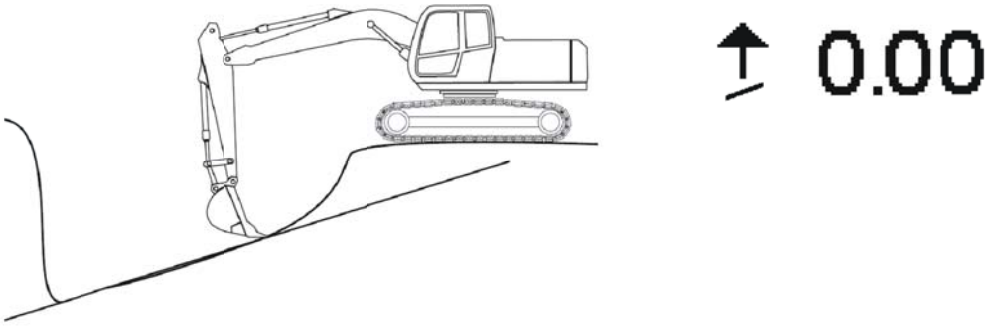
Set the slope value as described in “Creating/ editing a slope”.
Set the starting level to zero (press “0.0” for 3 seconds or “Main menu” → “Starting level”).
Move the bucket to the slope’s starting point. Zero the measurement value by pressing “0.0”. The reading “0.00” appears on the screen.



The “⊥“ value shows the height difference between the bucket and the target surface. The value above the surface is positive while the value below the surface is negative.

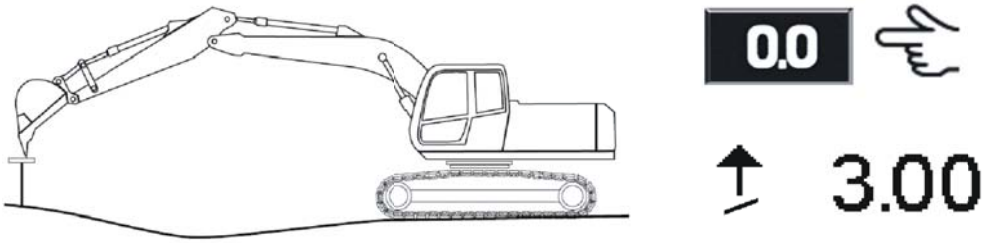


The target surface has been reached when the “⊥“ reading is “0.00”.

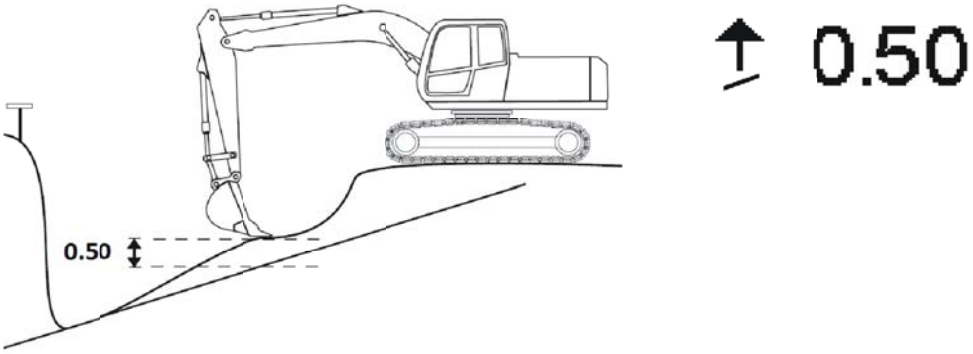


8.3. Slope digging with a known starting level

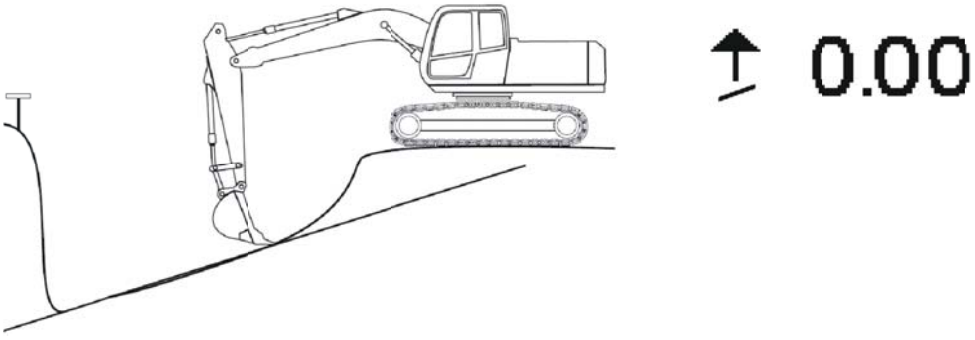
Set the slope value as described in “Creating/ editing a slope”.
The height difference between the starting point and the target level is the starting level (3.00 m in the example). Set this starting level in “Main menu” → “Starting level” or hold the “0.0” button for 3 seconds.
Move the bucket to a stake or another reference point. Zero the measurement value by pressing the “0.0” button. The starting level (“3.00” in the example) appears on the screen.



The “⏊“ value shows the height difference between the bucket and the target surface. The value above the surface is positive while the value below the surface is negative.



The target surface has been reached when “⏊“ is “0.00”.



8.4. Moving the excavator when measuring the slope

When the excavator is moved, its height continuously changes. To maintain the original reference level, the bucket either has to be taken to a certain reference point before and after moving the machine or a rotating laser has to be used.

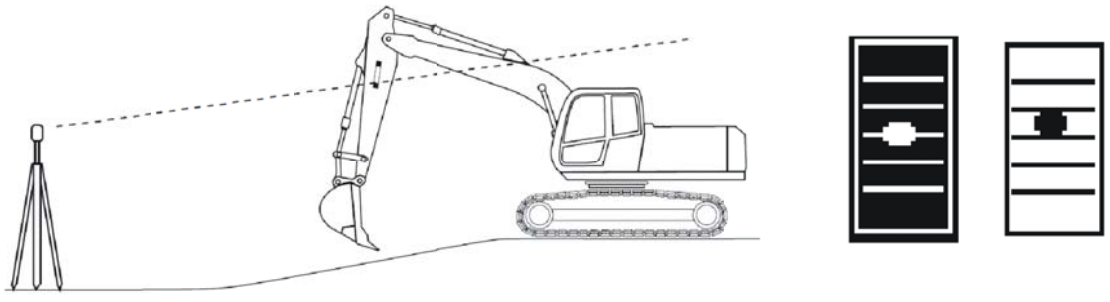
NOTE!

When moving the excavator it is recommended to use a laser receiver to achieve the best accuracy.

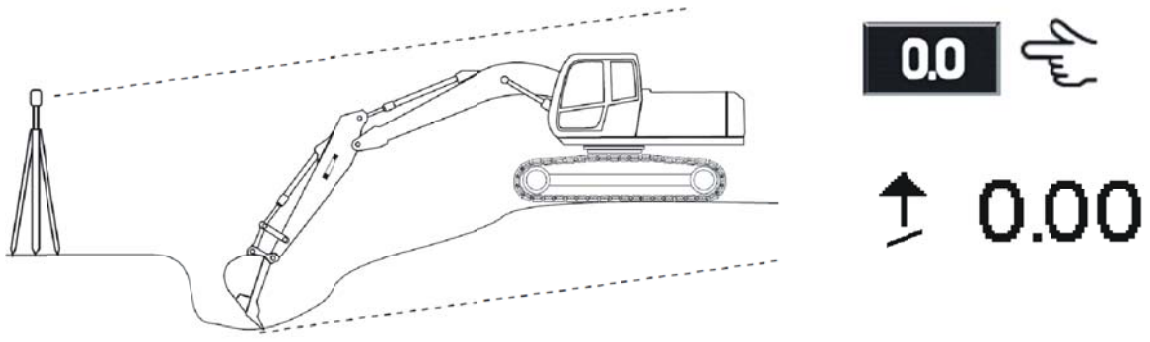
Moving the excavator with the laser receiver:

Tilt the laser transmitter to the gradient already entered into the system. Set the laser transmitter to any height. Make sure that the slope in Xsite EASY has been set to the same value. Go to the “Main menu” → “Laser”. Press the “Right arrow” button twice to enter page 3/3 and switch the laser ON. The laser can also be controlled with the “Power” button.

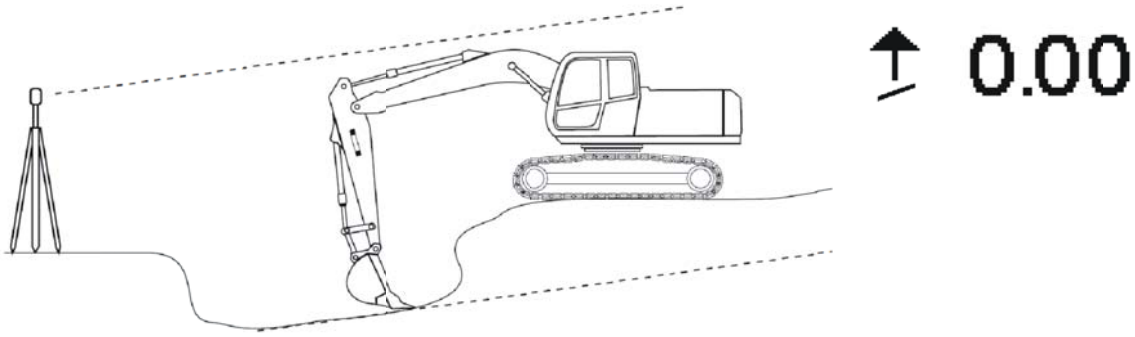
Move the boom slowly in a way that the laser receiver hits the laser beam. It is recommended to move the dipper stick to a position as upright as possible when reaching the laser beam. The laser receiver symbol on the screen indicates laser hits. The laser hit has been accepted when the text “Hold!” changes to “Hit accepted!” and the black background changes to a white background as shown below.



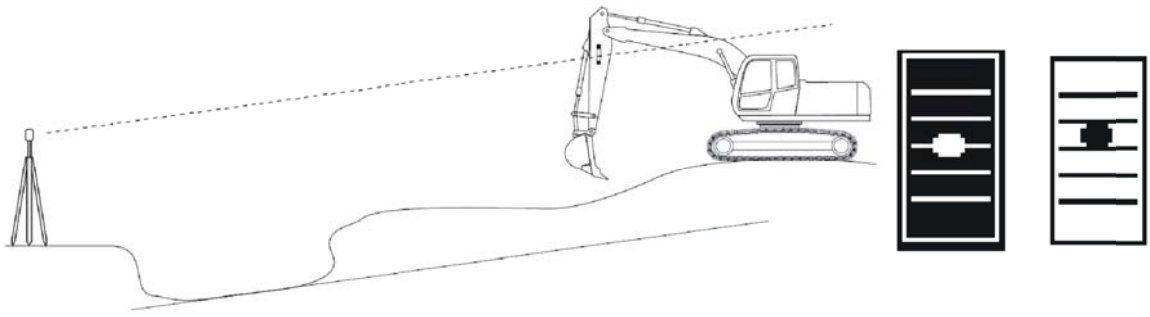
Zero the reading at the slope's starting point ("Starting level" = "0.00" in the example).



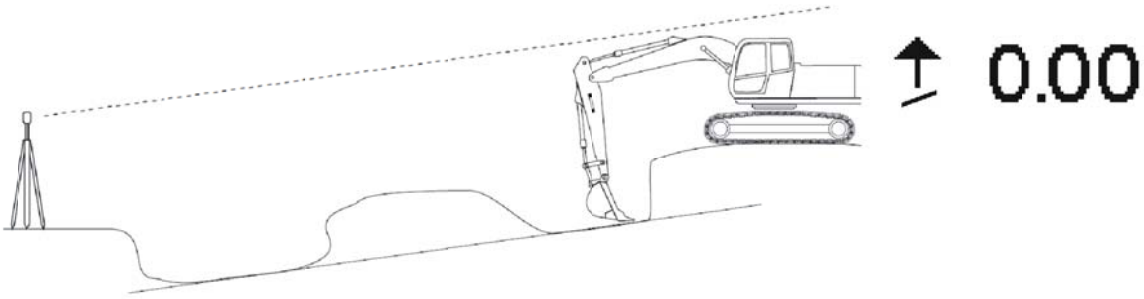
Measure the slope.



Move the excavator to a new place. Then move the laser receiver into the beam as shown below. It is recommended to move the dipper stick to a position as upright as possible when reaching the laser beam. The laser receiver symbol on the screen indicates laser hits. The laser hit has been accepted when the text "Hold!" changes to "Hit accepted!" and the black background changes to a white background.

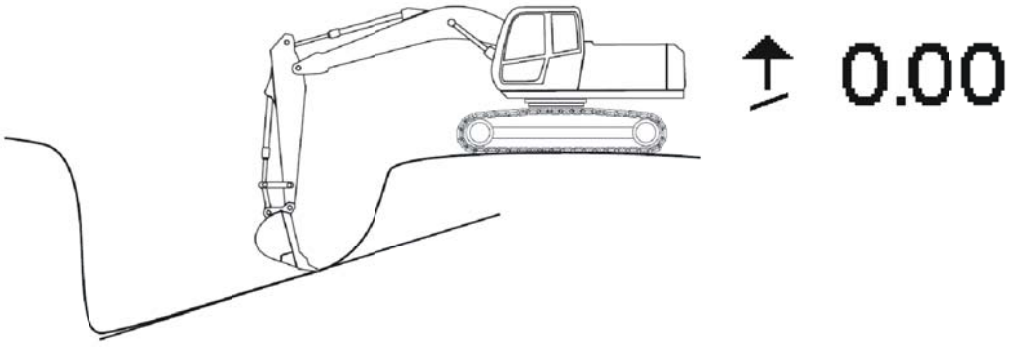


The digging process can be continued and the slope is measured in comparison to the original reference level.

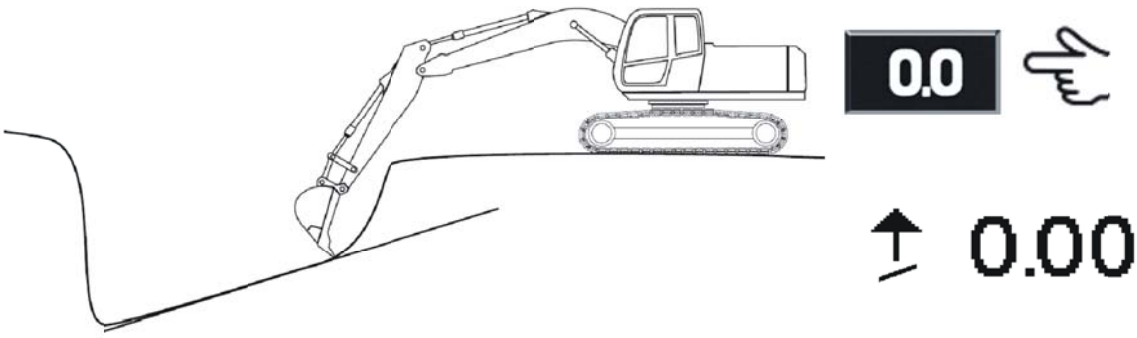


Moving the excavator using the zero function:

When measuring a slope, the excavator can be moved via the zero function. Measure the slope. In the example, the “Starting level” is “0.00”.



Move the machine to a new place. After the excavator has been moved, reach to the measuring point on the completed surface and zero the measurement value by pressing the “0.0” button. After zeroing, the digging process can be continued.



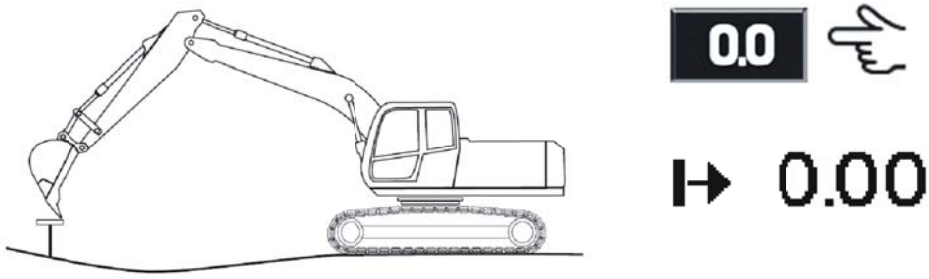
9. Distance measurement

Select a screen view which indicates the horizontal distance from the zero point to the bucket measuring point.

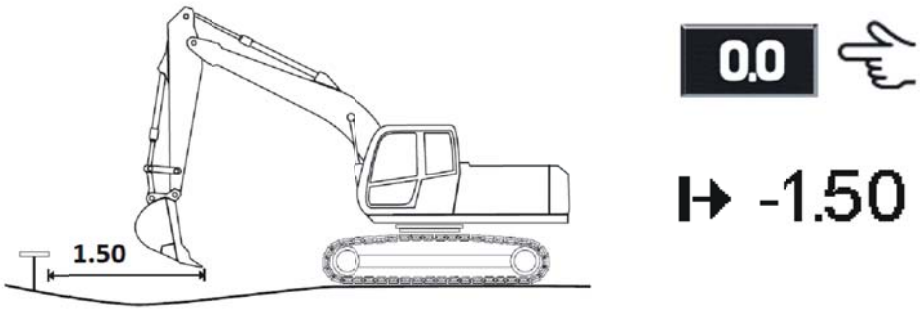
Check the system accuracy before starting to operate (also see "Accuracy check").

When measuring the horizontal distance, the starting point always is "0.00". The measurement value is zeroed at the starting point. The display shows the distance from the starting point to the bucket.

Move the bucket to a stake or another reference point. Zero the measurement value. The reading "0.00" appears on the screen.



When the bucket is moved away from the excavator, the distance value increases. When the bucket is moved nearer towards the excavator, the distance value decreases.

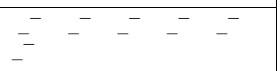
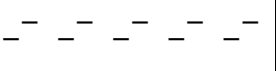
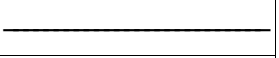
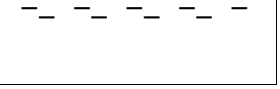


10. Target levels

The user can set four reference levels: top level, high level, target level and low level.

To set limits for the reference levels, go to “Main menu” → “Target levels” → “Limits”. Choose the level to be edited using the “Right” and “Left” arrow key and press “EDIT”.

Target level default settings:

Level	XD2 colour	Default values	Sound
Top level	Yellow arrow pointing downwards	Above the target level, 8-15 cm	
High level	Blue arrow pointing downwards	Above the target level, 3-8 cm	
Target level	Green line	Target level +/- 3 cm	
Low level	Red arrow pointing upwards	Below the target level, 3-8 cm	

To switch the target level sounds ON or OFF, go to “Main menu” → “Display unit” → “Sounds” and press the “OK” button in the “Target” selection.

The setting of the target level mode determines which measurement type the target level function complies with. Set the target level mode in “Main menu” → “Target levels” → “Mode”. Choose depth, distance, slope, laser jobsite height or auto as target level.

The jobsite target level can be adjusted in “Main menu” → “Laser” → page 2/3 “Jobsite target height”.
If the laser jobsite height is 100 m, for example, (the rotating laser is set to a height of 100 m) and the jobsite target height is 95 m, the XD2 LED display shows a green light when the bucket measuring point is 5 m below the laser beam.

10.1. The XD2 LED display

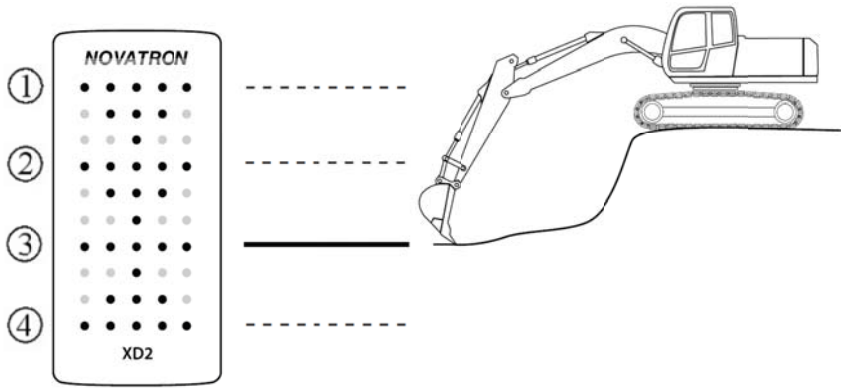
⚠ CAUTION

Epilepsy warning

Some people are susceptible to epileptic seizures or loss of consciousness when exposed to certain flashing lights or light patterns.

- Immediately discontinue use and consult a doctor if any of the following symptoms occur while using the Xsite EASY or the XD2 LED display: dizziness, blurred vision, eye or muscle twitches, loss of consciousness, disorientation or any involuntary movement or convulsion.

The XD2 LED display is an optional accessory. It indicates the height difference between the bucket measuring point and the target surface with light signals.
In the picture below the bucket measuring point currently is at the target surface.



1. Top level/ yellow
2. High level/ blue
3. Target level/ green
4. Low level/ red

To set the brightness of the XD2 LEDs, go to “Main menu” → “Target levels” → “Limits” and select the 5/5 page. Select “LIST” and choose “Bright”, “Medium” or “Dim”.

11. Warning levels

⚠ CAUTION

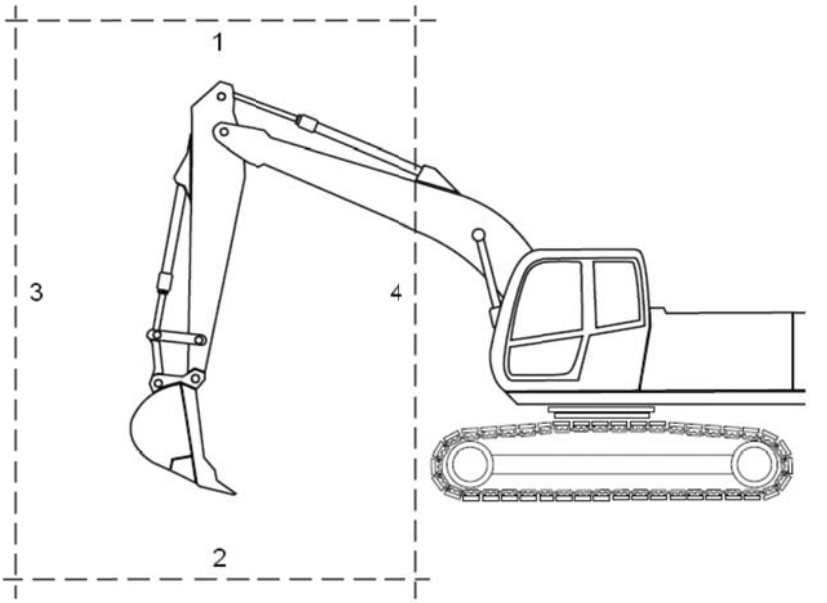
Risk of injury caused by moving machine parts!
During the controlling of the tool the machine's components and assembly groups are moved manually or automatically. Rotating and/or linearly moving components and assembly groups of the machine can cause severe injuries and material damages.

- Keep persons away from the machine's and the tool's working range respectively.
- Remove objects from the machine's and the tool's working range respectively.
- Do not interfere with the moving components during operation.
- Always switch off the machine before leaving the driver's seat or when the machine is standing still.

The warning level function gives an alarm if the bucket or boom reaches a predefined warning level.

IMPORTANT!
The warning level function does NOT stop the movement of the boom!
The warning level function does NOT guarantee your safety!
Please observe the security instructions in this manual.

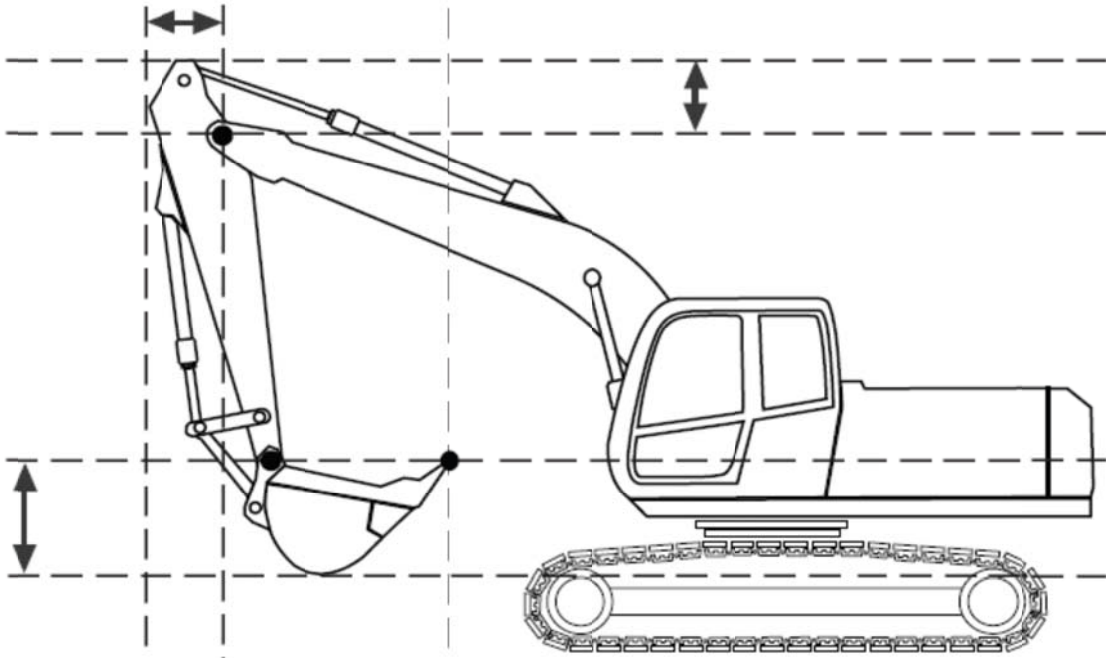
There are four warning levels:



1 High limit
2 Low limit
3 Far limit
4 Near limit

The system measures the position of the pivotal points: the tip of the bucket, the pivotal point between the bucket and the stick and the pivotal point between the stick and the boom.

Some parts of the bucket or boom may reach the warning levels before the system gives the alarm. Therefore a safety margin has to be applied when setting a warning level (see drawing below).



To set a warning level go to “Main menu” → “Warning levels” and choose one of the four warning levels.
For example, to set the high limit go to “Main menu” → “Warning levels” → “High limit”. If the high limit is OFF, switch it ON by pressing “CHNG”. Press the “Right arrow” to proceed. Lift the boom up until the bucket or boom is near the favoured high limit and press “SET”. The upper reading on the screen is the set warning level (values of high and low limit are compared to the main boom’s pivotal point and values of far and near limit are compared to the rotating centre point (/pivot bogie) of the machine). The lower reading in parentheses is the current position of the bucket.
When the warning level has been set, go back by pressing “EXIT” (bucket button).

If any of the pivotal points reaches the predefined limit, the system alarms the operator in the following ways:

- Warning sound
- Warning message in the screen's status bar
- Exclamation mark blinking on the XD2 light bar
  (XD2 is an optional accessory)

To switch OFF the high/low/far/near limit go to "Main menu" → "Warning levels" → "High/Low/Far/Near limit". Press "CHNG" to switch the warning level function OFF. Go back by pressing "EXIT" (bucket button).

IMPORTANT!

After the excavator has been moved, the warning levels have to be reset.

12. Service and Maintenance

The product has been developed to meet a high degree of operational reliability. All electronic components are enclosed in robust housings to safeguard them against any possible mechanical damage.
Nevertheless the device as well as the junction and connection cables should be periodically checked for potential damages and soiling.

The product's service and maintenance may only be carried out by qualified specialized personnel.

⚠ CAUTION

Risk of injury caused by inappropriate service!
Inappropriate service can lead to severe personal injuries or material damages.

- Have service operations exclusively carry out by suitably qualified personnel.
- Before starting operation ensure suitable mounting conditions.
- Care for order and cleanliness at the mounting site! Assembly parts and tools loosely lying about or on top of each other are accident sources.

NOTE ON CLEANING:

Do not on any account clean the display with agents containing abrasive substances. Otherwise the surface will be scratched and tarnished and the display gets complicated to read.

1) Switch off the product.

2) Put standard cleaning agent on a soft, lint-free cloth.

3) Clean the display without applying any pressure.

4) With a clean cloth, completely remove the cleaning agent.

13. Technical data

Xsite EASY display unit

Display size	2.7”
Resolution	128 x 64 pixels
Operating voltage	10... 36 VDC
Power consumption	2 W
IP classification	IP44
Operating temperature	-20°C... +60°C
Dimensions	132 mm x 144 mm x 45 mm (without RAM mount)
Weight	0.4 kg
I/O	CAN

G1 sensor

Measuring axes	X, Y, Z (three axes)
Resolution	0.05°
Measuring range	360° per axis
Operating voltage	10...36 VDC
Power consumption	2.5 W (heating on), 1 W (heating off)
IP classification	IP67
Operating temperature	-20°C...+60°C
Dimensions	98 mm x 41 mm x 33 mm
Weight	0.2 kg
I/O	CAN

EL2 laser receiver

Receiving angle	180°
Receiving area	150 mm
Resolution	5 mm
Operating voltage	10...36 VDC
Power consumption	2.5 W
IP classification	IP67
Operating temperature	-20°C...+60°C
Dimensions	315 mm x 96 mm x 55 mm
Weight	0.7 kg
I/O	CAN, RS-232
Compatible lasers	Rotating lasers (visible light and infrared)

XD2 LED display

LED type	RGB
Number of LEDs	50
Operating voltage	10...36 VDC
Power consumption	<2 W (type)
IP classification	IP43
Operating temperature	-20°C...+50°C
Dimensions	120 mm x 60 mm x 25 mm (without RAM mount)
Weight	0.04 kg
I/O	2 x CAN

14. Declarations of conformity

EC Declaration of Conformity

Document no: EDV3-EC-002

We, the undersigned,

Manufacturer:	Novatron Oy
Address:	Myllyhaantie 6 E, 33960 Pirkkala, Finland
Phone number:	+358-3-357 2600
Fax number:	+358-3-357 2677

certify and declare under our sole responsibility that the following equipment,

Name:	Easy Dig / Xsite EASY
Components:	100012 Easy Dig v3 display / 100022 Xsite EASY v3 display 130192 G1 sensor 100008 EL2 laser receiver 100065 XD2 LED display 140102 XD2 connection box

is in conformity with the requirements of EMC directive 2004/108/EC. The following standards have been applied: EN 13309:2010, ISO 7637-2:2004.

Place of issue:	Pirkkala, Finland
Date of issue:	12 March 2013

Jukka Tervahauta
Managing Director
Novatron Oy

FCC Declaration of Conformity

Document no: EDV3-FCC-002

We, the undersigned,

Manufacturer:	Novatron Oy
Address:	Myllyhaantie 6 E, 33960 Pirkkala, Finland
Phone number:	+358-3-357 2600
Fax number:	+358-3-357 2677

certify and declare under our sole responsibility that the following equipment,

Trade names:	Easy Dig / Xsite EASY
Model numbers:	100012 Easy Dig v3 display / 100022 Xsite EASY v3 display 130192 G1 sensor 100008 EL2 laser receiver 100065 XD2 LED display 140102 XD2 connection box

complies with part 15 of the FCC rules.

Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Place of issue:	Pirkkala, Finland
Date of issue:	12 March 2013

Jukka Tervahauta
Managing Director
Novatron Oy

Notes:

Copyright by
MOBA Mobile Automation AG
Kapellenstraße 15
65555 Limburg
Internet: www.moba.de

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MOBILE AUTOMATION

03/2013